BANISTERIA

A JOURNAL DEVOTED TO THE NATURAL HISTORY OF VIRGINIA

Richard Lawrence Hoffman
(1927-2012)

Richard Hoffman, the foremost authority on both the world's milliped fauna and Virginia's diverse invertebrate fauna, was a cofounder, life member, and honorary councilor of the Virginia Natural History Society. He also served as an original coeditor and more recently as an associate editor of *Banisteria*. During the past two decades he amassed a large, regionally significant collection of invertebrates and an internationally important collection of millipeds at the Virginia Museum of Natural History. An obituary, bibliography, and seventeen of the final papers authored or coauthored by this outstanding scientist, teacher, and mentor, who was widely regarded as one of Virginia's greatest naturalists, comprise this memorial issue of *Banisteria*.

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A JOURNAL DEVOTED TO THE NATURAL HISTORY OF VIRGINIA

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Cover: Richard Lawrence Hoffman; photograph by Rick Dawson.
Back cover: *Stenolemus lanipes* (Heteroptera: Reduviidae); free-hand drawing by Richard L. Hoffman.

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Number 40, 2012

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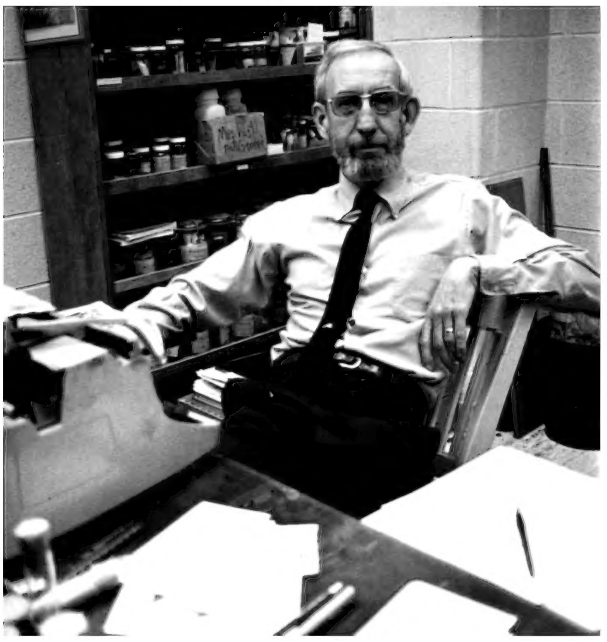


Richard Hoffman in his office at Radford University, fall 1981 (photo by Larry Davis, courtesy of Radford University Archives).

Editor's Note

This special issue of *Banisteria* is dedicated to the memory of Richard L. Hoffman (1927-2012), cofounder, original coeditor, and most recently associate editor of this journal. I would like to thank his fellow cofounder of this journal, Joseph C. Mitchell, for his advice, assistance, and encouragement related to the preparation of this issue. In the interval since Richard's passing, Joe B. Keiper, Executive Director of the Virginia Museum of Natural History, has granted me access to Richard's files and the museum's collections. For their many courtesies extended to me during my visits to the museum as well as for responding to additional requests made while I was in Richmond, I offer special thanks to Haley Cartmell and Jill Harris. The museum's publications committee granted permission to reprint three of Richard's popular articles in this journal. Likewise, the publisher of *The Virginian Review*, successor to *The Daily Review*, allowed me to reprint Richard's nature columns that originally appeared in the latter newspaper. I also offer my thanks to the various people who reviewed one or more of the manuscripts included in this issue, as well as those who provided photographs of Richard. Finally, I thank my family for tolerating the many nights, weekends, and more than a few holidays and vacation days that I devoted to preparing this issue of *Banisteria*, which was the most challenging one that I have produced during my 13-year tenure as coeditor or editor.

During a career spanning seven decades, Richard Hoffman published more than 540 scientific papers and books, including 91 papers, five book reviews, and an obituary in *Banisteria*. Even after his official retirement in April 2009 at the age of 81, he was still working at the museum 6-7 days a week on many old and new projects, actively curating the collection, and learning new groups of insects. Richard had plans to prepare dozens of additional papers, some of which were partially written at the time of his death. Following an obituary and summary of his contributions to *Banisteria* (plus a listing of his other recent publications), this memorial issue of the journal contains eight new papers and nine shorter contributions, all with Richard as sole or coauthor. Thereafter is a section entitled "Essays by Richard Hoffman," which contains 31 popular articles, including 27 weekly nature columns that he wrote in 1944 as a recent high school graduate (age 16). Three of the other essays were previously published by the Virginia Museum of Natural History and the fourth is new. My intent in reprinting the nature columns and popular articles is to showcase Richard's writing skill and style, his boundless enthusiasm for natural history and exciting new discoveries, his passion for biogeography, and his deep love for his native state of Virginia (specifically his two favorite places, Burkes Garden and the Mount Rogers-Whitetop Mountain area), as well as his belief in the role (at least occasionally) of serendipity in discovery. Lastly, I include the previously unpublished essay, without his explicit consent, which I hope will be of interest and enjoyment to the readers of this journal, for which Richard Hoffman was its most ardent supporter.

Steve Roble, *Banisteria* Editor

Banisteria, Number 40, pages 5-14

Obituary: Richard Lawrence Hoffman (1927-2012)

Richard Hoffman working in his laboratory at the Virginia Museum of Natural History, Martinsville, Virginia, ca. August 2007. Photo by Judy Winston.

Virginia recently lost one of its most valuable human resources. Richard Lawrence Hoffman (age 84) died on June 10, 2012, from complications following open heart surgery. His breadth of knowledge and contributions to science on animals ranging from millipeds to insects to worms to amphibians and reptiles, especially in Virginia, will never be matched. He was one of the last old-time naturalists. Many details of his life are reviewed in the biographies by Roble (2009) and Mitchell (2009), from which some of the information presented here is derived.

Richard Hoffman was born on September 25, 1927, in Clifton Forge and spent his youth exploring the countryside where he developed a strong love of natural history. He almost finished his undergraduate degree in biology in 1950 at the University of Virginia but was unable to complete a freshman math class. He was accepted to graduate school at Cornell University in 1951 where his major professor and the dean accepted his 29 publications as being equivalent to passing the math course (Roble, 2009). He completed his Master's degree in Entomology in 1959 but worked at the Radford Arsenal as a chemist when he was not at Cornell or in the field. Richard obtained his Ph.D. in Zoology in 1960 from Virginia Tech where he wrote his dissertation on the taxonomy of branchiobdellid worms (crayfish commensals), describing a dozen new species in the process (Hoffman, 1963). In the same year, he accepted a teaching position at Radford College (now Radford University) where he taught numerous courses over a 28-year period, including general biology, general zoology, freshwater biology, invertebrate zoology, entomology, herpetology, mammalogy, biogeography, and the history of science. Richard served as editor of *The Radford Review*, the school's scholarly journal, from 1964 to 1970. In 1981, he was profiled in *The Chronicle of Higher Education* as an example of a highly productive researcher at a small teaching university (McDonald, 1981). Richard retired from Radford University in 1988 and joined the newly established Virginia Museum of Natural History as Curator of Recent Invertebrates in early 1989 at the age of 61. Richard retired from state service on April 1, 2009, after a period of 48 years, but only in a formal sense because he still came in to the museum six to seven days a week to work on the collection, various projects, and his publications. He is survived by a brother, Hank Hoffman; a daughter, Marian Evans

(husband Rich); two sons, Lawrence Hoffman (wife Kristi) and Carl Hoffman (former wife Reba); grandchildren, Brittany Evans, Brett Evans, Rachel Hoffman, Mary Hoffman, and Ella Hoffman; and a nephew, Robert Hoffman.

Without question, Richard Hoffman was the most knowledgeable person on the natural history of Virginia and the southern Appalachians. His original interest in natural history in his teen years was on herpetology. His scientific contributions began in 1944 at the age of 16 with the publication of several papers on amphibians and reptiles of the Clifton Forge area (Hoffman 1944a, b), including the first Virginia record of the Coal Skink (*Plestiodon anthracinus*). During the latter half of that year he also wrote 27 weekly nature columns for the local newspaper concerning various animals and conservation (Roble, 2009; see Essays section of this issue, pages 93-108, for the full text of these writings). Richard initially wanted to pursue a career in herpetology but he was discouraged by several prominent herpetologists at the time who told him that there were already enough taxonomists in that field (Mitchell, 2009). During his freshman year at the University of Virginia, Richard was again discouraged from pursuing a career as a taxonomist because his professors were not interested in taxonomy; in response, he briefly changed his major to geology the next year. However, shortly thereafter, the most significant event in shaping Richard's future career occurred when Horton H. Hobbs, Jr., a crayfish taxonomist, was hired as a new faculty member. Working under Hobbs, Richard learned thoroughness, organization, taxonomy, and how to be a good scientist. To the end of his life he considered Hobbs his only true mentor. Richard initially studied crayfish with Hobbs, but eventually they mutually agreed that Richard should find his "own" group to study. He quickly realized that there was plenty of room for taxonomic contributions on many groups of invertebrates and ultimately chose millipeds, a poorly known group (of which he was formerly terrified to encounter in the field; Mitchell, 2009) with potentially high diversity, at least in part because they occur under the same rocks and logs as the salamanders and snakes he had pursued in his youth. Although Richard became a world-renowned milliped taxonomist, he never lost his love of the amphibians and reptiles, especially salamanders, of Virginia.

Richard Hoffman was the world's foremost authority on the classification of millipeds, a distinction he held for at least half a century. The first of his 380 papers (through 2012) on millipeds was published in 1947 when he was 20 years old. During his lifetime, Richard described more than 400 species (or subspecies) and more than 200 genera of millipeds. He also co-authored the descriptions of one genus and two species of centipeds. Two families, six genera, 19 species, and two subspecies of millipeds, as well as two centipeds, were named in his honor. Richard was actively working on dozens of additional projects and papers concerning milliped taxonomy (as well as still more on Virginia natural history) at the time of his death. His systematic and revisionary research resulted in numerous contributions to milliped classification, such as erecting new tribes and subfamilies and other higher taxa, as well as nomenclatorial changes (Sierwald, 2009). Shear (2009) prepared a succinct summary of Richard's contributions to the field of myriapodology (the study of millipeds and centipeds). In addition to his voluminous papers, Richard produced important monographs on two large families of predominantly African millipeds (Hoffman, 1990a, 2005), a large, detailed summary of the history and (then) current status of milliped classification (much of it derived from his own research and hypotheses about taxonomic relationships; Hoffman, 1979), and two checklists of the North and Middle American milliped fauna (Chamberlin & Hoffman, 1958; Hoffman, 1999b). He also wrote the milliped chapters for the classic books on soil organisms (Hoffman, 1990b) and fossil arthropods (Hoffman, 1969c). Richard contributed the milliped entries for several encyclopedias, the last of which was published this year (Hoffman, 2012b). From 1978 to 2007, he edited *Myriapodologica*, an occasional periodical of his own creation that published more than 100 articles (half authored by Richard) pertaining to milliped taxonomy during its existence.

Richard Hoffman mentored several other leading myriapodologists, including Bill Shear (Hampden-Sydney College and current VNHS secretary-treasurer) and Rowland Shelley (North Carolina State Museum of Natural Sciences), among others. Shelley was quoted shortly after Richard's death as equating the impact of his loss on the study of milliped taxonomy to that of Einstein's passing on physics, saying "He knew more than anybody. He was the grand master" (Rupert, 2012). Shelley (pers. comm.; Shelley, *in press*) also likened Richard's passing to an extinction, comparing it to the loss of a species or the unwritten language and culture of a remote primitive tribe, because of his unparalleled knowledge of not only millipeds, but many other organisms (especially invertebrates). Richard had an encyclopedic knowledge of the scientific literature on millipeds (and other groups) and was the first and still only person capable of identifying virtually any milliped in the world on sight to at least the tribal level. Shelley concluded that Richard's breadth of knowledge and level of expertise will never be matched.

Richard Hoffman published 73 papers on various aspects of the conservation, distribution, and natural history of amphibians and reptiles, almost all of which were based on observations in Virginia (Mitchell, 2009). He recognized the two distinctive calls of the gray treefrog complex (*Hyla chrysoscelis* and *H. versicolor*) and outlined their distribution pattern in Virginia two decades before they were recognized as separate species (Hoffman, 1946; Johnson 1966). He was the first to note the expansion of the range of *H. chrysoscelis* westward onto the Blue Ridge escarpment in Floyd County (Hoffman, 1996). He described two subspecies that were later considered invalid (Six-lined Racerunner [*Aspidoscelis sexlineata*], Seal Salamander [*Desmognathus monticola*]) (Hoffman 1951, 1957). Most of his herpetological contributions consisted of distribution records and included checklists for Alleghany County (Hoffman, 1945), Fort Pickett (Hoffman, 1953), Burkes Garden in Tazewell County (Hoffman & Kleinpeter 1948a; Hoffman, 1955, 1983), and Mount Rogers (Hoffman & Kleinpeter, 1948b). He later summarized all of his observations on the herps of Alleghany County in a four-part series (Hoffman, 1985a, b, 1986, 1987a) published in *Catesbeiana*, the journal of the Virginia Herpetological Society, for which he had suggested the name. Richard was a member of that society for most years from its founding in 1958 until his death. His recent papers on herps include one on anuran distribution records in Greensville County (Hoffman & Mitchell, 1996) and a review of his general observations of changes in amphibian populations in the Clifton Forge area over many decades (Hoffman, 1992). His latest and perhaps final herpetological contribution (Hoffman 2012d, this issue) concerns biogeographical issues in Virginia, including a challenge to other herpetologists to document new state records.

In his late teens and early 20s, Richard boldly corresponded with leading scientists of the time, especially herpetologists and botanists. He spent time in the field with well-known botanists of that era such as Lloyd Carr and Arthur Massey, and later Robert Kral. He eventually served as the major professor of Doug Ogle, who became a well-respected botanist in his own right. One of Richard's earliest papers concerned the distribution of red spruce in Virginia (Hoffman, 1950). While he was still an undergraduate at the University of Virginia, Richard wrote a book review for a national journal of the newly published *Mammals of Virginia* (Hoffman, 1948). Charles O. Handley, Jr., the lead author, was a contemporary and eventual long-time acquaintance of Richard's (they were born three years apart) and another of the last old-time naturalists in Virginia. Handley was widely recognized as the foremost authority on the state's mammal fauna for the duration of his life and also became a leading mammalogist of his generation (Pagels, 2000).

Richard Hoffman was the leading expert on the invertebrate fauna of Virginia and one of the most knowledgeable authorities on the biota of the southern Appalachian Mountains. He was especially interested in millipeds, spiders, beetles, and true bugs, but was also well-versed in many other groups, including mollusks, crayfish, worms, harvestmen, and centipeds. He also coauthored five papers on Virginia's caddisfly fauna (e.g., Flint et al., 2004, 2008, 2009). Among beetles, Richard was especially interested in ground beetles (Carabidae) and long-horned beetles (Cerambycidae). He published nine papers on carabids. In recent years, he had started several papers on both groups and had plans to write still more papers on other families of Virginia beetles. With Perry Holt, his doctoral advisor, Richard served as coeditor of the classic volume on the biogeography of southern Appalachian invertebrates (Holt et al., 1969). He also contributed an important paper on the origin and affinities of the region's milliped fauna (Hoffman, 1969b).

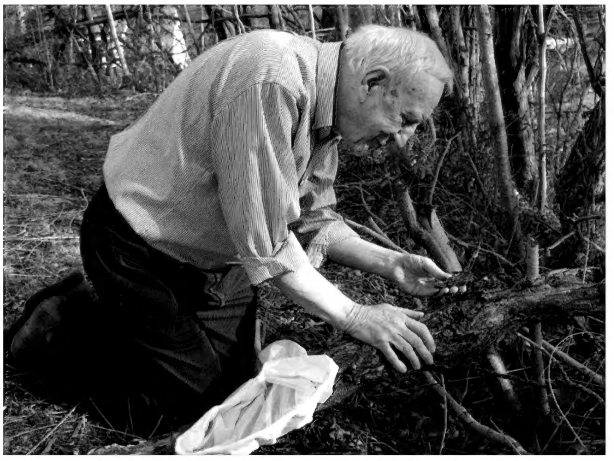
With his longtime friend and colleague Michael Kosztarab of the entomology department at Virginia Tech, Richard cofounded the series entitled *The Insects of Virginia*. It was originally published by Virginia Tech and later by the Virginia Museum of Natural History. A total of 15 fascicles appeared between 1969 and 2006, including five written by Richard. His first contribution to the series was a classic summary of Virginia's biogeography (Hoffman, 1969a). His later fascicles concerned various families of true bugs (Heteroptera). At the time of his death, Richard was actively working on an annotated checklist of the more than 300 species of plant bugs (Miridae) of Virginia with Thomas Henry of the National Museum of Natural History, Smithsonian Institution. He had also begun to prepare a similar list of the more than 500 species of ground beetles that inhabit the state.

In 1987, Richard wrote an important conservation-related paper entitled "Local Sites of Special Concern in Virginia" in which he identified various areas of the state that either harbored rare and endangered species, or he suspected had the potential to do so and were in need of inventory surveys (Hoffman 1987b). Richard had planned to write an addendum for *Banisteria* but no such manuscript was prepared. Several of the areas discussed in his 1987 paper have since been protected as nature preserves by state agencies and private conservation groups, including Buffalo Mountain and Dragon Run Swamp. Others were already owned by natural resource agencies (e.g., U.S. Forest Service), such as Laurel Fork, Potts Mountain bog, and Breaks

Richard Hoffman, Radford College, early-mid 1960s (photo courtesy of Gene Hyde, Radford University Archives).

Richard Hoffman in his office at Radford University, fall 1981 (photo by Larry Davis, courtesy of Radford University Archives).

Attendees at the 1st "North American" myriapod conference, Radford College, 1976; from left to right: Rowland Shelley, Andrew Weaver, William Shear, and Richard Hoffman (photo provided by Richard Hoffman).



Richard Hoffman peeling bark in search of insects, ca. 2001. Photo by Melody Cartwright, Virginia Museum of Natural History.

Richard Hoffman "teaching" a soil ecology class at Wintergreen Resort, Nelson County, Virginia, 2007 (photo courtesy of Doug Coleman, The Wintergreen Nature Foundation).

Richard Hoffman with sons Lawrence and Carl at his 80th birthday symposium, Virginia Museum of Natural History, Martinsville, Virginia, September 2007. Photo by Melody Cartwright, VMNH.

Interstate Park. Richard also coauthored an important, oft-cited summary of the physiography, climate, and natural communities of Virginia (Woodward & Hoffman, 1991).

Richard was a strong proponent for the conservation of biodiversity his entire life, initially expressing his concerns in the final two nature columns he wrote as a teenager (see pages 107-108 of this issue). He was a Life Member and generous supporter of The Nature Conservancy and collaborated with state agencies (Department of Conservation and Recreation and Department of Game and Inland Fisheries) for many years, serving as chair of the DGIF invertebrate taxa committee and editor of the arthropod chapter in the comprehensive book on the state's rare biota (Hoffman, 1991). During the last decade of his life, Richard tried unsuccessfully to enlist several state agencies and private conservation groups to protect a small seepage wetland he discovered in southeastern Franklin County that harbors several rare and uncommon insects and an unusually diverse copepod fauna that includes eight undescribed species, four of which are currently known nowhere else in the world (Reid, 2009).

Richard had a great love for Virginia, including its geology, topography, scenery, seasons, and especially the biota. He could have pursued more lucrative jobs, and perhaps more prestige, at larger universities or museums in other states but was too strongly attached to his native state to consider leaving it. Most of his field work was conducted in Virginia, with occasional excursions to the mountains of North Carolina and Tennessee, and rarely to other nearby states. Despite his vast expertise on the milliped fauna of Africa, he never visited that continent, relying on others (especially Kim Howell in Tanzania; e.g., Hoffman & Howell, 2012) to provide specimens from there and other exotic places. His foreign travel was largely focused on studying historically important milliped collections in European museums. During a 1995 trip to Costa Rica he provided training to two biodiversity inventory programs. Among his favorite places in Virginia were Burkes Garden (Tazewell County), the Mount Rogers-Whitetop Mountain area (the state's two highest peaks), Buffalo Mountain (Floyd County), Greensville County (especially Fontaine Swamp), Pinnacles of Dan (Dan River Gorge, Patrick County), and Breaks Interstate Park (Dickenson County). His popular articles on the first two areas are reprinted in this issue (see pages 84-89).

During the last quarter century of Richard's life, in his role as a museum curator, his vocation was truly his avocation. He often had limited curatorial help, so frequently worked alone and eagerly sorted, pinned, and labeled thousands of specimens before identifying them. The motivation behind his long hours of work in the laboratory each day was the chance to find a "gold nugget" (Richard's term) – a rare, uncommon or undescribed species or a good geographic record (new state record, range extension, disjunct locality, etc.) – or minimally, a species new to the museum's collection. On many occasions he excitedly informed SMR via phone or email of a new identification of interest (several papers in this issue are derived, in part, from information contained in email messages of this nature). More than a few times Richard prefaced weekend email messages with remarks such as "Too good to wait until Monday in case I die tomorrow." Ironically, Richard rarely placed his own determination labels on the many thousands of specimens that he identified at the Virginia Museum of Natural History, at least in part because he considered the species labels on unit trays (pinned insects) or in jars and vials (alcohol-preserved specimens) to be sufficient.

Richard was a lifelong learner, always eager to tackle new groups of organisms, particularly insects, especially families of beetles and true bugs with which he was not previously familiar. One of the papers in this issue (see pages 49-53) is the direct result of his recent efforts to curate the click beetle collection. Besides his role as Curator of Recent Invertebrates, Richard was also responsible for the museum's publications for several years and, just prior to his retirement, he briefly served as the Director of Research and Collections. He worked diligently for many months (perhaps even several years) to get the reprint edition of Covell's (2005) moth field guide published and personally packaged many boxes for shipping to customers. Later, he spent many weeks curating the museum's expanding collection of moths, a group of insects he had vowed many times never to work with because of his dislike for their scales and, especially, hairy caterpillars.

Richard had a strong devotion to curation, extending right up to the last week of his life, though at the expense of writing more papers on milliped taxonomy. He never had a goal to describe a certain number (e.g., 500 or 1,000) of species during his career. Although nearly half of Virginia's approximately 200 millipeds, the highest total for any state, are still unnamed, Richard readily admitted that he was not motivated to describe most of them in his lifetime. He once wrote "One soon finds that [milliped research] is hardly compatible with compulsive collection-building. It is far more fun to pin neat insects and key them out than to write boring text about body details of new millipeds." (Hoffman, 1994). His philosophy on the need to describe every new milliped found in Virginia is also reflected in these comments taken from the essay reprinted on pages 90-91 of this issue "… this number

increases on an annual basis. Under such conditions, the thrill of discovery wanes and describing the accumulation becomes a chore. But occasionally, a capture is made that transcends the tedium of 'another one to be named'." If a species especially piqued his interest, Richard could prepare a formal description of it in a day or two. Noting his occasional ambivalence pertaining to milliped research as opposed to Virginia insects, Richard cited a letter (Hoffman, 1994) from a foreign colleague who encouraged him to work on millipeds, writing "... you are like the last rainforests; when you disappear a world databank will be lost – but the invertebrates of Virginia will still be alive."

Besides millipeds and centipeds, Richard described 16 species and one genus of other invertebrates, including a spider, harvestman (also a new genus), leech, nematode, and a dozen branchiobdellid worms. Despite this broad range of taxonomic expertise, he generously allowed others to describe species he had personally collected, recognized as new to science, and was fully capable of describing himself. For example, in 1983 Richard discovered *Sigmoria whiteheadi*, a milliped still known only from the type locality along the Blue Ridge Parkway. One of only two millipeds in Virginia with legal status (state threatened), it was described by his colleague Rowland Shelley in the context of a generic revision (Shelley, 1986). Likewise, the recently described centiped *Strigamia hoffmani* is known only from Richard's collections made at Bent Mountain (1985) and Burkes Garden (2001) in western Virginia (Pereira, 2009). In yet another case, Richard patiently waited 44 years for the description (Barr, 2009) of a ground beetle to appear in print; ultimately, it was named for him (*Maronetus hoffmani*).

Taxonomists other than myriapodologists named 14 species and one genus of invertebrates in Richard's honor, including nine insects (three beetles and one each of springtails, diplurans, mayflies, stoneflies, caddisflies, and true bugs), three crustaceans (amphipod, isopod, and ostracod), two worms (nematode and branchiobdellid) and a genus of mites. Also, one salamander was named in his honor – the Valley and Ridge Salamander (*Plethodon hoffmani*) – by his long-time friend and occasional field companion Richard Highton (1971). Hoffman had collected the type specimen near his home town of Clifton Forge in 1944. Highton (2009) described how the description of the Peaks of Otter Salamander (*Plethodon hubrichti*) on which he and Richard were about to publish was underhandedly thwarted by Gordon Thurow (1957). In total, nearly 50 taxa were named in Richard's honor, a remarkably large number of patronyms for one scientist.

Richard Hoffman was a lifelong advocate for the study of natural history. He strongly supported the creation of the Virginia Museum of Natural History in the mid-late 1980s. He was also perhaps the best "ambassador" for the Virginia Natural History Society, not only by cofounding (with JCM) and publishing many papers in *Banisteria*, but by actively attempting to recruit new members among professional colleagues (both within and outside of Virginia), amateur naturalists, students, and librarians. He was passionate about Virginia's natural history in particular, and enthusiastic and encouraging whenever anyone showed interest in a facet of the state's biota and its natural history. Likewise, though ultimately to no avail during the past several decades, he was regularly seeking prospective authors for *The Insects of Virginia* series. He believed that everyone, including amateur naturalists, should publish more of their observations and discoveries, including Virginia records in *Banisteria*. He frequently referred to the analogy of an unplanted seed, meaning that good intentions to publish one's observations and findings were not the same as actually doing so and sharing them with the rest of the world. In his own words "Unpublished knowledge is like buried treasure" (Hairston, 2000).

Richard had an insatiable thirst for knowledge about the natural world, but despite his vast expertise, he knew his limits and wasn't hesitant to say "I don't know." He frequently stressed that there is still much to learn about the biota of Virginia, especially the invertebrates. For many such groups, he often noted that we have barely scratched the surface of what there is to learn, including taking the first step of gathering baseline survey information to determine which species inhabit the state and where. Richard was truly a "Master Naturalist" and eagerly shared his knowledge with both professional colleagues and amateur naturalists. He regularly gave talks or led hikes for The Wintergreen Nature Foundation, The Nature Conservancy, Virginia Museum of Natural History, and the Mount Rogers naturalist rally. He occasionally helped train foreign biologists in field inventory methods at the Smithsonian Institution's facility at Front Royal, Virginia.

Richard was well versed in the history of biological exploration in Virginia and the southern Appalachians. His plenary address at the Appalachian biogeography symposium held at Virginia Tech in 1995 only partially demonstrates his grasp of the subject (Hoffman, 1999a). Richard prepared several manuscripts for the "Historical Contributions" section of *Banisteria* and had plans to submit even more such papers in the future. His closing remarks at the Virginia Natural History Society's 2009 symposium on the history of natural history in Virginia will appear in the next issue of this journal (Hoffman, *in press*).

A symposium was held in honor of Richard Hoffman's 80th birthday in September 2007 at the Virginia Museum of Natural History and resulted in a beautiful edited book that contains 32 papers by 41 authors on four continents (Roble & Mitchell, 2009). The diversity of papers in the *Festschrift* reflects both Richard's broad interests and the respect he had among his peers worldwide. The book's title acknowledges that Richard was a giant in two fields of study, namely millipeds of the world and Virginia's natural history. In an unusual action for a *Festschrift* volume, we coaxed the honoree into preparing a paper. Richard chose to summarize his thoughts on the history and future of myriapodology (Hoffman, 2009).

Richard Hoffman was the true southern gentleman scientist. He was a generous and caring individual who loved Virginia and its natural wealth. He was well known for his zeal to educate anyone who cared to listen. He was an eloquent speaker. Some of his presentations were compiled the day before or on the spot. Among his many teaching and scientific research awards are the Virginia Lifetime Achievement Award from the Virginia Museum of Natural History, the Edward H. Abbuehl Award for Environmental Education from the Friends of the Blue Ridge Parkway, and the Lifetime Achievement Award from the Virginia Herpetological Society. He will be long remembered for his education of many students and colleagues, his scientific contributions to state, regional, and global biodiversity, his love and knowledge of Virginia, his generosity, and his quiet, unassuming but passionate approach to life. JCM last saw Richard in July 2011 when he visited him in Martinsville. Richard was excited to show him an insect that he had found in a swimming pool when he took a break from the heat one day (see Hoffman 2012a). It was easy to tell that he had plans for many publications, some of which had been in preparation for years. Unfortunately, some of these will never be finished. Richard had a long and productive life, succeeded in living his dream of being a classical taxonomist, and almost got his wish (Rupert, 2012) of dying while working at his microscope. A memorial service for Richard Hoffman was held at the Virginia Museum of Natural History on July 21, 2012. A generous bequest from Richard will help establish an endowment at the museum to further support curation of the Recent Invertebrates collection. The Virginia Natural History Society recently contributed to a matching fund for that purpose.

In closing, Richard's own eloquent words (Hoffman, 2012c), contained in a letter written in remembrance of an esteemed milliped taxonomist (*Graf* Attems) of an earlier generation, are worth repeating in the context of his own career and accomplishments:

> "In every aspect of learning or accomplishment, there are those whose experience and knowledge endows them with singular authority. Standing like the occasional peaks which soar above others of a mountain system, such persons are recognized and respected for the magnitude of their contributions, whether of word or deed. But accomplishment alone means little if it has not been transmuted into a tangible legacy – the judgment of posterity will be weighted by the degree to which the fruits of accomplishment are shared, and knowledge in particular must be incrementally passed from one generation to another … every scientist is forever in the debt of those in whose steps he follows and in whose shadow he learns and grows in wisdom. Perhaps the greatest single legacy bestowed on me by *Graf* Attems has been the importance of remembering the needs of the new and inexperienced, and so to pass on one's knowledge in a form that will ease and facilitate their own careers and contributions in research."

We have lost one of the most important pillars in Virginia's natural history. Much of the advancement of natural history in the Commonwealth will be based on the foundations that Richard Hoffman provided. We can follow the example of his life and career to inspire us all to learn more about the natural world, to share that knowledge with others through writing and teaching, and to support efforts to protect our native biota for future generations. Richard Hoffman will long be remembered as a champion for the study and conservation of our natural heritage.

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Scientific Publications of Richard L. Hoffman

Compiled by Steven M. Roble, Editor, *Banisteria*

Richard Lawrence Hoffman was a prolific and gifted writer who published more than 520 scientific papers and books during his lifetime, as well as more than 50 popular articles. At the time of his death at age 84 on 10 June 2012, he was actively working on several dozen additional projects, manuscripts, and notes, with many others in the early planning stages. Some of these unfinished projects and papers may be completed by others, but most will likely never appear in print, at least not under his name. Seventeen of Dr. Hoffman's final papers pertaining to the natural history of Virginia appear in this issue of *Banisteria* and several more will be published in future issues of the journal.

All of Dr. Hoffman's publications (scientific and popular, with two omissions noted below) that were published through 2008 were summarized in the bibliographies compiled by Joseph C. Mitchell (2009; herpetological titles), Petra Sierwald (2009; myriapodological titles), and me (Roble, 2009; all other Hoffman publications) for the *Festschrift* volume published in honor of his 80th birthday and career accomplishments (Roble & Mitchell, 2009). In that work, I prepared three graphs that summarized the volume and scope of Dr. Hoffman's writings over a period of 65 years (1944-2008). I have now updated these graphs (Figs. 1-3) for the benefit of *Banisteria* readers to include papers (including those appearing in this issue) that were published during the last four years of his life (2009-2012). Starting at the age of 17, Richard Hoffman published at least one scientific paper per year for 69 consecutive years, averaging almost eight papers and more than 100 printed pages annually. In the past two decades he published more papers pertaining to the natural history of Virginia (mostly included in the "Other taxa and misc." line of Fig. 2) and somewhat fewer on millipeds.

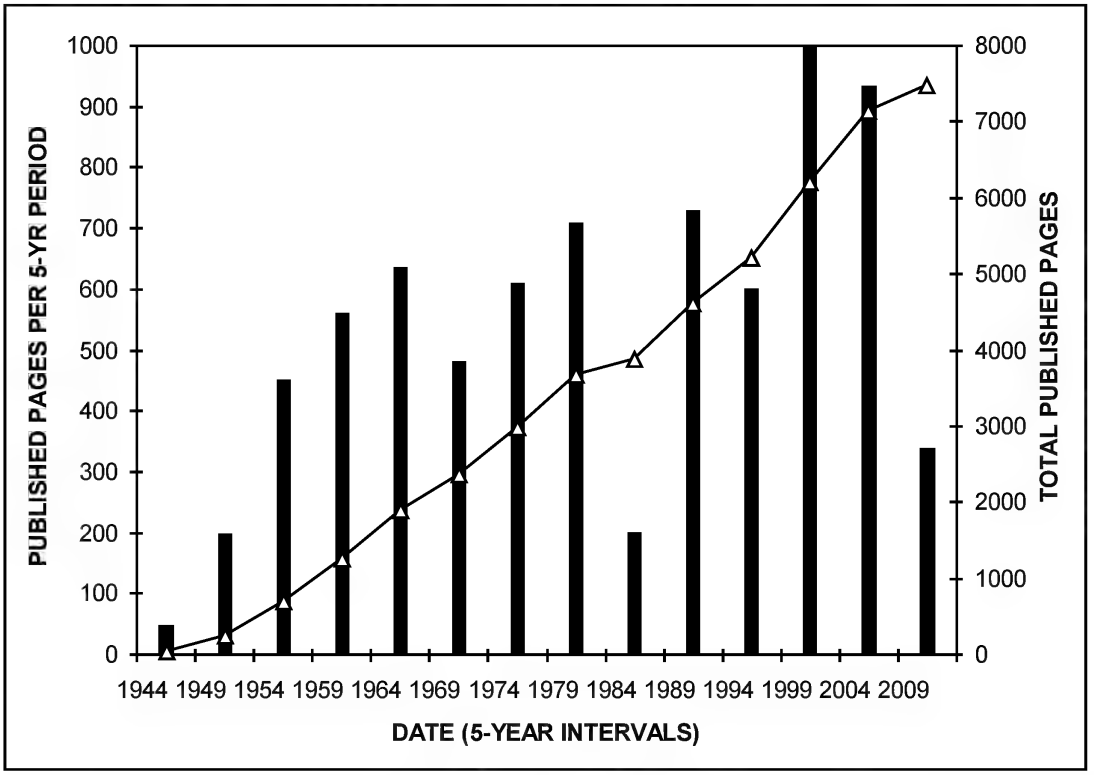

Fig. 1. Summary of Richard Hoffman's scientific publications 1944-2012; the last interval spans the final four years of his life. He was the sole author of the vast majority of his papers, which accounted for an average of more than 100 printed pages annually over nearly seven decades.

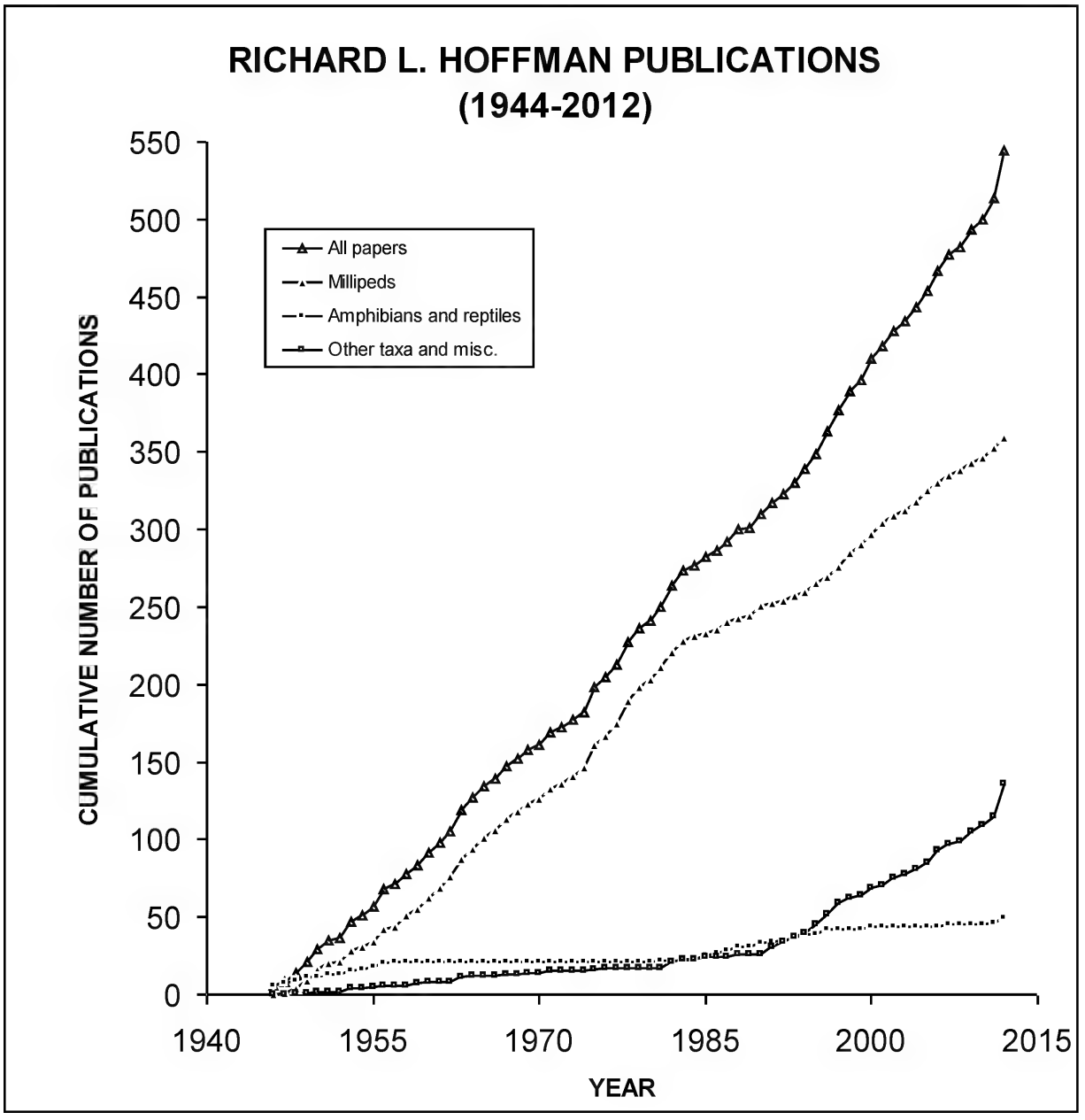

Fig. 2. Summary of Richard Hoffman's scientific publications 1944-2012. Most of his papers concerned milliped taxonomy, for which he was the world's foremost authority. He also published more than 50 popular articles that are not included in this figure. Note the consistency of the slope of the "All papers" line over nearly seven decades, averaging almost eight papers annually.

Richard Hoffman was the most frequent and prolific contributor to *Banisteria*, publishing 91 papers (52 as sole and 21 as first author), five book reviews, and one obituary through 2012. He was also a founding coeditor, associate editor, and frequent peer reviewer. A complete list of his *Banisteria* contributions (in chronological order) appears below, along with a summary of his other known publications (n = 26), mostly pertaining to milliped taxonomy, of which he was the world's foremost authority, that have appeared since 2008. All told, Dr. Hoffman published 59 papers in the past four years. The final tally of his scientific papers and books will undoubtedly exceed 550 titles and 7,500 pages.

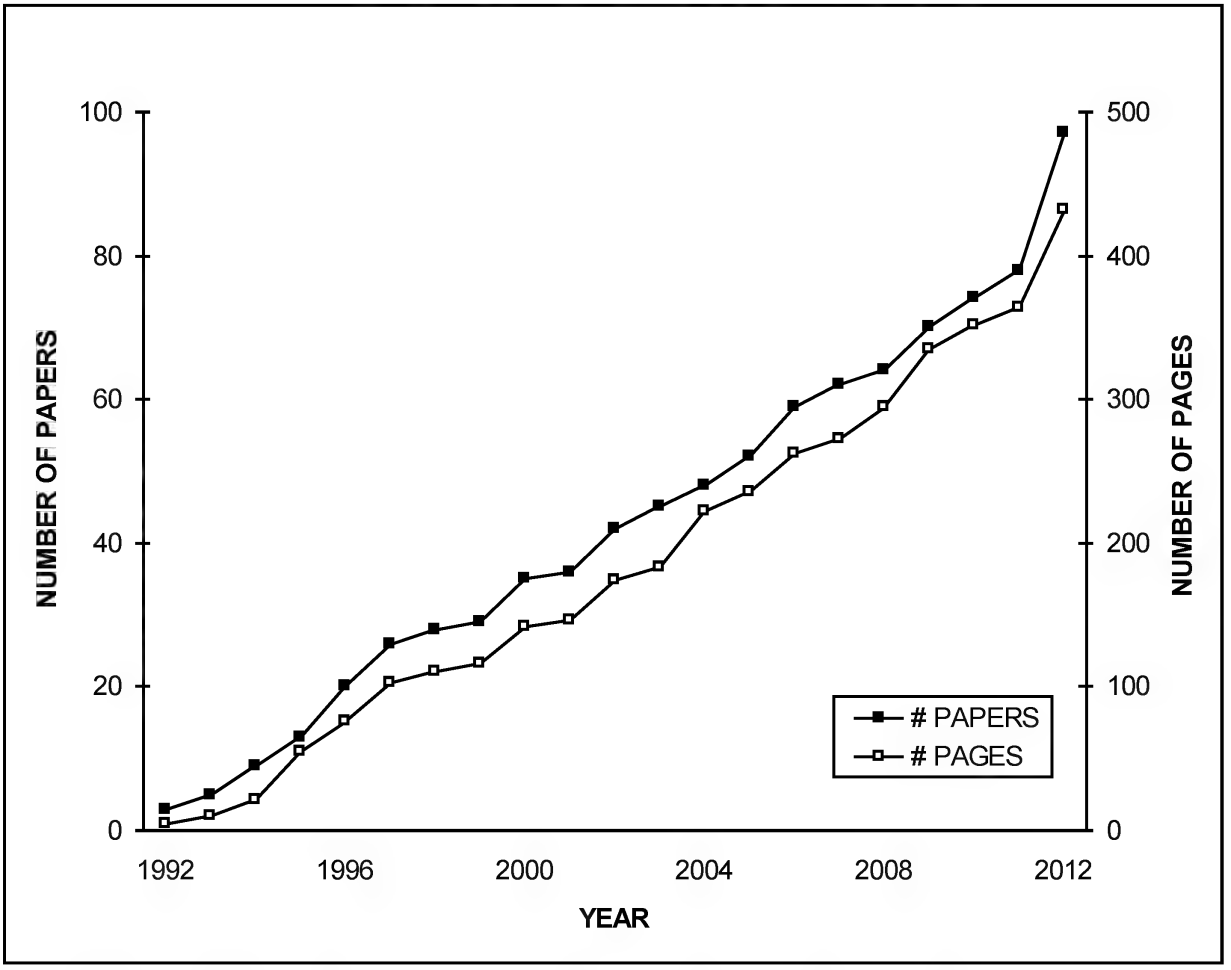

Fig. 3. Summary of Richard Hoffman's publications in *Banisteria* 1992-2012 (includes five book reviews and an obituary). He was by far the most frequent and prolific contributor to this journal, of which he was a cofounder and original coeditor. Dr. Hoffman suggested the journal name to honor John Banister (1650-1692), the first university-trained naturalist to work in Virginia.

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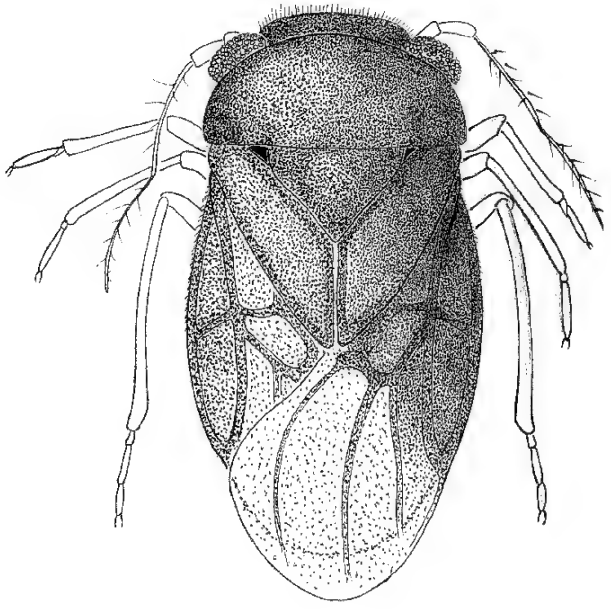

Corixidea major McAtee and Malloch, a rarely collected true bug (Heteroptera: Schizopteridae), length <1.5 mm; original drawing by Richard L. Hoffman (previously published as the cover illustration for *Banisteria* 26).

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Spot-problem Solving: A New Approach to Virginia Herpetology for the Next Millennium

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ABSTRACT

Recommendations are provided for future studies addressing the geographic distribution of amphibians and reptiles in Virginia. Four categories are discussed: possible additions to the state's fauna, valuable in-state distributional refinements, verification of curious localities, and the potential for new species in Virginia.

When I was first asked to present some commentary on the occasion of the Virginia Herpetological Society's annual meeting in Richmond in October 1999, my initial inclination was to look backward over the 60 years of my interest in the Virginia fauna. It is always tempting to indulge in reconstructing how things were long ago (after all, I was conceived in the year that Dunn's *Salamanders of the Family Plethodontidae* was published), and how they have changed. Often such glimpses of the past are the most interesting things that elders can contribute. After some consideration, however, I decided that a look into the future might be valuable also. I propose such a look to be not one of prophesy, but one of possibility.

As in every other aspect of human activity, herpetology in this country has gone through some remarkable evolution, starting with the great foundation provided by Holbrook's *North American Herpetology* (1836-1842) and Cope's *Crocodilians, Lizards, and Snakes of North America* (1900). In turn we have had the famed checklists of Stejneger & Barbour (1917), the advent of *Copeia* (first published in 1913), the inauguration of generic revisions following the model of Ruthven's (1908) treatise on *Thamnophis*, a number of state herpetologies (each bigger and better than its predecessors), Dunn's (1926) famous salamander book, Ditmars' popular accounts (e.g., 1907), and the first of a flood of field guides, Conant & Bridges' (1939) *What Snake is That?* Then state and/or regional herpetological societies, more new journals, and upgrading of the old ones. Statistics, karyotypes, cladistics, electrophoresis. Endangered species; conservation biology. In Virginia, we have gone from Dunn's (1918) key and list of state herps to fairly sophisticated baseline summaries in the final decades by Tobey (1985) and Mitchell (1994), the latter closing out the century with an atlas of state records (Mitchell & Reay, 1999). At least we have a general idea now what is here, and where it occurs, about twice as many species as Dunn listed. With this much of a start, perhaps it is justified to consider what might be emphasized in the decades to come.

About a decade ago, I annotated a Virginia county map with what at the time I thought would be good places to investigate for interesting new information about the in-state distribution of our native herp fauna. I mapped four categories: possible additions to the state's fauna, valuable in-state refinements, verification of curious localities, and possible new species, about 20 sites in all (see Figure 1 for an updated map). With the passage of some ten years, only a single speculation has been fulfilled: the discovery of a new salamander (*Plethodon sherando*) in the central Blue Ridge (Highton, 2004). Also, Tilley et al. (2008) recently validated the status of *Desmognathus planiceps*, a species which I helped discover more than a half century ago (Newman, 1955), only to see it relegated to the synonymy of *D. fuscus* a few years later (Martof & Rose, 1962).

I very much doubt that any further new species, even in the boundless genus *Plethodon*, are likely to be found, although Tilley et al. (2008) hinted at the possibility of another new *Desmognathus* along the Blue Ridge

*Deceased. This paper was mostly written around 2000 and partially updated in early 2012 several months prior to Dr. Hoffman's death. Some editorial changes, new text, and literature citations were added by Steve Roble, *Banisteria* editor, who also prepared the bibliography and updated map.

escarpment a short distance north of the Virginia-North Carolina border. Nevertheless, there are still a lot of challenges for those looking for something to do, maybe even close to where they live. Bear in mind that the following entries are just some that occurred to me over the years; doubtless the list could be considerably expanded and herpetologists are urged to submit their own contenders.

In trying to organize my thoughts about this, I produced several categories within an overall theme. It seems that with only a few exceptions, most investigations of our herp fauna have been to answer the questions "What?" and "Where?". And, to be sure, these should and must be prioritized as the first steps in this course of knowledge. We must learn to crawl before we learn to fly, and inventory is basic to anything. I would be the last to denigrate faunistic and local biogeographic studies (I have long been a practitioner of both), or suggest their discontinuation, but so often these approaches are largely opportunistic and casual. "I've lived here for X years and these are the species I've found" OR "I lucked out with a great roadkill that extends the known range of *X. y.* some 25 km ..." Cumulatively, all this random and aimless pack-ratting has largely defined our present knowledge of distributions in the state.

In developing conservation strategies, we have gone from protecting individual species to protecting entire ecosystems. What I will propose here for future in-state studies is just the reverse: going from the collective (faunistic) approach to the individual. For lack of a better name, I suggest "Spot-problem Solving": which is to say, considering various aspects of local herps on a deliberate, intentional, per-species basis. Let me give a few of the larger categories that I can imagine, and a few examples for each. The geographic bias will be obvious enough, but the same thing can be extended into studies on ecology, life history, population structure, or whatever you wish. The examples given are just the tips of icebergs of ignorance and can be indefinitely expanded.

I. Adding species to the known state faunal list

There are a LOT of species known from adjacent states, in localities virtually on the Virginia state borders. The recent discovery of *Pseudacris nigrita* in southeastern Virginia (Hobson & Moriarity, 2003) is a prime example of this sort of potential new state record. There being no obvious physical or ecological barriers, there is every reason to suspect that some or all of the following species will also be added if somebody simply makes a personal crusade to search as long and intensively as necessary to turn them up. Starting with the southeast we have:

(1) *Anolis carolinensis*, not yet documented with a real Virginia specimen, but with enough circumstantial evidence to suit me that it occurs in the Dismal Swamp. Residents living south of Cypress Chapel described the species to me accurately enough, in 1947, and I think the old literature record (Stansbury, 1924) for Lake Drummond is also definitive, although Mitchell et al. (1999) argue otherwise. The northern limits of this species' range extend entirely across North Carolina from about Edenton to the Blue Ridge, at about 40-50 miles south of the Virginia border (Palmer & Braswell, 1995). At what point might not this line lobe northward into southside Virginia? I think that any state-line county/city from the coast as far west as Clarksville stands a good chance of harboring small populations of this lizard.

(2) The northernmost locality cited for *Nerodia fasciata* by Palmer & Braswell (1995) is Urahaw Creek, Northampton Co., NC, which is 16 miles/26 km south of the Virginia line near Boykins, with absolutely no break in habitat continuity. Water snakes are not usually hard to find, and would not a prolonged search in Fontaine Swamp be a reasonable effort to expend to add another native snake to our list?

(3) *Rhadinaea flavilata* and *Seminatrix pygaea* have nearly the same range in eastern North Carolina, both occur as far north as the Outer Banks at Nags Head (Braswell, 1988; Palmer & Braswell, 1995). These snakes should be sought in extreme southeastern Virginia, such as in the Back Bay/False Cape area.

(4) *Eurycea chamberlaini*, a species recently distinguished from *E. quadridigitata,* has been found just 13 miles/21 km south of Virginia (in line with Buggs Island dam), just east of Henderson, Vance Co., NC (Harrison & Guttman, 2003). Again, without a physical or ecological barrier in the way, can we believe that this species would not be found by a search through springs and seeps in Mecklenburg County? For whatever the rumor may be worth, I was told many years ago by Maurice K. Brady (a Washington, DC herpetologist) that he had seen Virginia specimens, taken by the entomologist Titus Ulke in Warwick Swamp [Prince George or Sussex Co.], while he was pulling moss from cypress trunks and knees in his search for beetles. Brady was certainly familiar with the local fauna, and he was at pains to assure me that he could distinguish *E. quadridigitata* from small *E. bislineata* (local populations now referable to *E. chamberlaini* and *E. cirrigera*, respectively). Of course, Ulke's material was not preserved, but would not this lead be worth pursuing during the cooler months of the year?

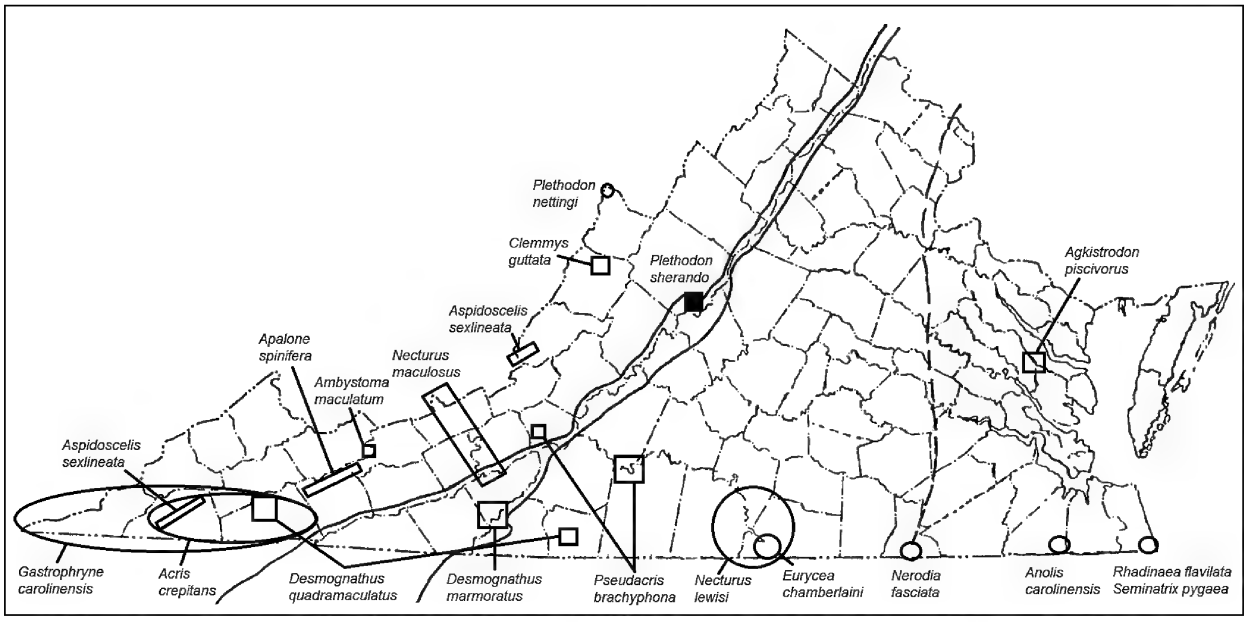

Fig. 1. Generalized locations of areas in Virginia that warrant targeted surveys for selected species of amphibians and reptiles. Circles along the state border indicate areas to survey for potential new state records. All other symbols refer to either questionable or unsubstantiated records that require verification, or indicate areas where a species may occur in Virginia outside of its currently documented range. The solid square denotes the range of *Plethodon sherando*, a recently described species (Highton, 2004). Solid lines traversing the state indicate the limits of the Blue Ridge physiographic province and the dashed line marks the location of the Fall Line separating the Coastal Plain and Piedmont regions. See text for further details.

(5) *Necturus lewisi* may in fact be confined to the Neuse River in North Carolina, but the headwaters of that system oppose tributaries flowing north into the Roanoke River basin in Virginia. There is thus the chance that stream captures might have given *N. lewisi* access to the north, and this can never be discounted until somebody initiates extensive trapping in Halifax and Mecklenburg counties, VA, using the exact protocols specified in Braswell & Ashton's (1985) detailed account of this aquatic salamander.

(6) *Plethodon nettingi* has been found only a few miles west of the upper corner of Highland Co., VA, and the Locust Springs region should be worked over carefully. Dr. Richard Highton has collected there, but he admitted that he had not gone up into the red spruce forest above the camping area. I'd consider the odds for success in adding *P. nettingi* to the Virginia fauna as "not bad."

II. Verification/confirmation of undocumented or suspect records

In one guise or another, some species have shown up in the literature at sites outside the probable local range. While such wraiths are extremely difficult to eliminate by subsequent collecting (a specimen with even a dubious locality always trumps any amount of unsuccessful attempts at verification), at least the case for skepticism can be reinforced. There are really a lot of loose ends that need to be checked out. The following list is only a tithe of what's lurking in the record books:

(1) *Desmognathus marmoratus*, formerly placed in the monotypic genus *Leurognathus*, has been repeatedly found in the Laurel Creek drainage basin between Damascus and Troutdale in Washington Co. It has also been recorded for two Patrick Co. localities, both of which remain to be confirmed: one being the headwaters of Laurel Fork at mile 174.3 on the Blue Ridge Parkway, the other a so-called "Crumpacker's Mill" on the upper Dan River. The former record (plotted in Conant, 1975 and all subsequent editions of his field guide) originated from a reputable collector (Samuel H. Sweet), but one who also picked up aquatic salamanders farther south, in North Carolina, where *D. marmoratus* does occur, on the same collecting trip. I have, alone or with colleagues, worked at the Parkway locality and many others on the headwaters of the same stream for about 20 years, using the seine-downstream-to-kicked rocks technique, which produced plenty of *D. monticola* and *D. quadramaculatus*, but nothing that might pass for *D. marmoratus*. To the best of my knowledge, there is not

nor ever was a Crumpacker's Mill in Patrick Co. (local residents are also unaware of such a locality), and seining in the upper Dan around Cockram's Mill, on U.S. Rt. 58 near Meadows of Dan, has been negative so far. This purported record is based on a specimen in the Duke University collection obtained by the distinguished herpetologists Carl Gans and Joseph R. Bailey and family (Tobey, 1985). Maybe a general and intensive all-purpose survey of the region might turn up specimens, but to my mind, the overall stream structure there does not look like *D. marmoratus* habitat. These two records strike me as a sort of "cold cases" but I suppose they cannot be discredited by the assumption of mislabeling. Let's keep on looking even as a "long shot" venture.

(2) *Clemmys guttata* in the Cowpasture River? The range maps in Mitchell (1994) and Mitchell & Reay (1999) show the majority of dots in the Coastal Plain and outer Piedmont, with a few in the Shenandoah Valley, and none at all in the folded Alleghanies. Around 1935, when I was about 8 years old, a Sunday afternoon family automobile excursion had me standing on the bridge over the Cowpasture River at Fort Lewis in Bath Co. Directly below, some 15 feet beneath my feet, were two black turtles with numerous yellow spots on their carapaces. Subsequent inspection in "Compton's Pictured Encyclopedia" disclosed a photograph of this very species, identified with the same Latin name as in current usage. I do not believe it is possible that I could have mistaken the animals for anything else. Many visits to the site in subsequent years have never revealed spotted turtles again. But only a hundred meters downstream, on the eastern side, is a rather long floodplain pond, formerly a part of the original channel, and it may be possible that this pond, rather than the river, was the source of the two turtles that I saw. It may take nothing more than a pair of binoculars to confirm this record, or perhaps some turtle traps would be more effective. In any event, the locality merits an adequate follow-up.

(3) *Ambystoma maculatum* is widespread in Virginia although records are scarce west of the Blue Ridge (Mitchell & Reay, 1999). I was recently advised by a resident of Burkes Garden, Tazewell Co., that his son had discovered a black "lizard" about a foot long, with two rows of yellow spots, in an empty fishpond at his house. I never listed *A. maculatum* in several accounts of the Burkes Garden amphibian fauna (Hoffman & Kleinpeter, 1948; Hoffman, 1955, 1983), as the paucity of breeding sites seemed to be an excluding factor, but I apparently underestimated the ability of the species to improvise, as the nearest surface water to the capture site could not have been less than a mile (1.6 km). If the record is confirmed, Burkes Garden will probably be the highest place (3200 ft/975 m) at which *A. maculatum* is known, and the question can be addressed, where do they breed in that strictly karst topography?

(4) All of the verified localities of *Pseudacris brachyphona* in Virginia lie west of the New River and north of the Iron Mountain foothills (Hoffman, 1981; Tobey, 1985; Mitchell & Reay, 1999). In 1950 I heard this species calling at Wabun in western Roanoke Co., which is farther east, but was unable to voucher the record. The Duke University collection has a specimen of *P. brachyphona* from the Smith Mountain gorge, Pittsylvania Co. This locality seems somewhat too removed from the known eastern periphery of the species' range (Pulaski Co.) to accept without verification, and Mitchell & Reay (1999) judiciously did not include it on their map for *P. brachyphona*. Some road-cruising on rainy spring nights would seem mandated as the easiest way to pick up new records if indeed the species does occur there in an extremely disjunct population.

(5) What about *Necturus maculosus* in the upper Kanawha River? I previously mentioned (Hoffman, 1984) a specimen of this species supposedly taken in the New River just above Radford, at a site long since inundated by Claytor Lake. As the specimen had been lost some time after I saw and recorded it (Hoffman & Mitchell, 1994), the locality was omitted from the Mitchell & Reay (1999) atlas map. Nonetheless, *N. maculosus* has been captured farther downstream in the New River Gorge in West Virginia, using search techniques developed by Kurt A. Buhlmann. Dr. Buhlmann informed me that this species is usually found in emergent beds of riverweed (*Justicia americana*) along this river. Could these techniques not be applied to appropriate reaches of the New River in Virginia in an attempt to verify the species' presence here? What a nice warm-weather pastime for a canoer!

(6) And speaking of canoe opportunities, there is an unconfirmed sighting of the Eastern Cottonmouth (*Agkistrodon piscivorus*) in Dragon Run, upstream of the U.S. Rt. 17 bridge near Saluda (Middlesex Co.). Many years ago I was assured by Paul Donnelly, on the landscape architecture staff at UVA, that he had made such an observation, and staunchly defended his ID against my claims of old male *Nerodia sipedon*: he asserted that he knew the difference, that water snakes did not display a wide, white mouth. If such a find, anywhere along Dragon Run, could be confirmed, a nice northern extension of range would be established. Even if his snake turned out to be only *Nerodia taxispilota*, that would not be all bad, either.

III. Fine-tuning ranges

Although of a low order of scientific importance, it is nonetheless a harmless and pleasant occupation to map out the present distribution of various species with precision. Salamanders lend themselves well to this pastime (most reptiles are out of the question!), and not long ago I published (Hoffman, 1992) in *Catesbeiana* what I still consider as the definitive statement about the range of *Plethodon yonahlossee* in Virginia. This same approach can be applied to any species that is not actually statewide, to finally locate the peripheral populations.

(1) I have collected many records for *Desmognathus quadramaculatus* over the past several decades, but there remain many unresolved issues, in particular with respect to the western boundary. Dunn's (1918) early record for "Abingdon" needs confirmation, as does a spot on Tobey's (1985) map representing Brumley Creek, in the western part of Washington Co. The species apparently is not in Tumbling Creek, 10 miles to the northeast along Clinch Mountain, at any rate. The map for this species in Mitchell & Reay (1999) shows a spot in Henry Co., VA, based on material in the Carnegie Museum said to have been collected by George W. Burton at Spencer. I have so far been unable to confirm this outlying site, and suspect mislabeling (Burton spent summers at Mountain Lake [Giles Co.], where *D. quadramaculatus* is common), but I may have missed just the one cool spring branch, and the matter remains open pending still more field work. I know that the species extends northward along the Blue Ridge escarpment in Franklin Co., but that area too, remains open-ended as it is in adjoining Floyd Co. I believe that the locality spotted in Alleghany Co. IS in fact the northernmost population in Virginia.

(2) *Aspidoscelis* (formerly *Cnemidophorus*) *sexlineata* occurs over much of Virginia east of the Blue Ridge, and follows the valleys of the Roanoke and James rivers westward into the folded Alleghanies. It is abundant around Clifton Forge, for instance, and has been found southwest of Covington along Potts Creek. How far north does it extend into Bath Co., and how far southwest along Potts Creek, where dry shale barren habitats provide continuous habitat? Just 20 more miles in that direction would place the species in Monroe Co., WV. This species was recently added to the fauna of West Virginia based on records obtained in the Eastern Panhandle (Morgan Co.) near the Potomac River (Humphries et al., 1999). It is also known from eastern Tennessee almost to the Virginia border (Conant & Collins, 1998). In far southwestern Virginia, one can expect *A. sexlineata* in Scott Co. in the Clinch River valley. This lizard is partial to railroad rights of way so perhaps some time invested in walking along the tracks in the stretch between Clinchport and Dungannon might yield some sightings and specimens, as would the parallel fallow fields in the Clinch River floodplain.

(3) Almost the same statements could be made for *Acris crepitans*. Cricket frogs are known from the Eastern Panhandle region of West Virginia (Green & Pauley, 1987), as well as eastern Tennessee along the Holston River (Redmond & Scott, 1996), but confirmed Virginia records are lacking for this species west of Roanoke (Mitchell & Reay, 1999). It occurs along rivers, even small rocky creeks, but is rarely evident except where an impoundment is made. The Holston and Clinch river floodplains in Washington and Scott counties should be surveyed for this species.

(4) A breeding chorus of *Gastrophryne carolinensis* was discovered in 1950 from a site along U. S. Rt. 58 west of Jonesville, Lee Co., VA by Fowler & Hoffman (1951). The specimens were later misplaced or lost, and the original site has since been converted into a cornfield. Two additional localities along the Powell River in Lee Co. were documented in 1958 by Burger (1974), but the species is obviously uncommon there and his specimens were also lost. Due to the loss of all vouchers, none of these records was plotted in the Mitchell & Reay (1999) atlas. Roble & Hobson (2000) found another small breeding colony of *G. carolinensis* west of Jonesville in 1995 (which is plotted in the atlas). This species was reported from Bluff City, TN, by Bailey (1936), only a few miles south of Bristol on the South Fork of the Holston River, presaging discovery in that part of Washington Co., VA. Redmond & Scott (1996) plotted a second record in Sullivan County, TN (borders Scott and Washington Cos., VA). In that connection, some years ago Douglas Ogle gave me a newspaper clipping that featured an odd small frog found under a board at a sawmill site near Damascus. The caption account of an inch long, wedge-shaped animal match the blurry photograph well enough to strongly suggest that the creature was indeed a *Gastrophryne*. There is in fact no reason why this species will not be found in the larger river valleys of Lee, Scott, and Washington counties, perhaps most effectively by road-cruising after heavy summer rains with low atmospheric pressure.

The distribution of *G. carolinensis* in the southern Piedmont is also worthy of further study. I thought that Pittsylvania and extreme eastern Henry Co. formed the western range limit of this species in this region (Hoffman, 2000), but, astonishingly, Fredericksen et al. (2007) reported the capture of a specimen near Ferrum in

Franklin Co. to the northwest.

(5) How far upstream does the spiny soft-shelled turtle (*Apalone spinifera*) extend in the North Fork of the Holston River? Douglas Ogle told me that it is not uncommon around Saltville. Voucher specimens from anywhere along this river (and the Clinch as well) would be very desirable.

I recently happened across a paper (Redmer et al., 1999) treating the occurrence of two species of treefrogs in southern Illinois, and take this opportunity to use it as a kind of model of what can be done. In the example shown, *Hyla cinerea* was cited for only four localities in P. W. Smith's herpetology of Illinois (1961), but in the more recent paper, 127 sites are mapped and the known area of distribution more than tripled for the state.

IV. Non-distributional problems

There are again a lot of intriguing issues in other domains to be worked up by patient local studies. Here are two obvious examples:

(1) Until just recently, we had only one species of *Kinosternon* in Virginia, *K. subrubrum*, the well-known mud turtle which is widespread east of the Blue Ridge. Now confusion has been introduced by the recognition of *K. baurii*, a Coastal Plain resident which can be primarily distinguished by resort to morphometric comparisons (Lamb & Lovich, 1990). If these two concepts really represent actual species, there must be some kind of effective isolating mechanism that prevents inter-breeding, as shades of difference in body form and proportion are unlikely to be perceived and respected by the animals themselves. In the Coastal Plain where two taxa reportedly occur, concentration on this problem might reveal differences in breeding season, different chemical attractants, or some totally unanticipated mechanism. The regrettable effect of basing biological studies on organisms that have not been adequately defined taxonomically is that whatever was published about the original species is instantly invalidated when it is found to be two (or more) sympatric species!

(2) Why, as I have noticed repeatedly in southeastern Virginia, as well as locally here in Martinsville (Hoffman, 2007), will a particular site suddenly burgeon with vast choruses of some frog or another, despite showing no evidence of being there in previous years, under what seemed to be optimal conditions for calling and at virtually the same dates. I have no idea how this might be investigated, but it is a curious and exasperating phenomenon.

In conclusion, while opportunistic captures and sightings will always be a useful source of information and should not be denigrated, I believe that selection of specific problems and application of concentrated effort toward their solution should be given increasing emphasis in the future. Such narrowed focus offers the reward of both increased understanding of our local species, but the added pleasure of achieving often elusive goals. A similar approach can be applied to address distributional problems of many other taxonomic groups.

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Lawrence M. Carter and Richard L. Hoffman with an Eastern Ratsnake (*Pantherophis alleghaniensis*) along the North Landing River in southeastern Virginia, May 1948 (photo provided by Richard L. Hoffman).

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Drawing the Line on Sweetgum: Fine-tuned Phytogeography Part I. Virginia North to the Roanoke River

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ABSTRACT

The distributional limits of sweetgum (*Liquidambar styraciflua*) in the southern Piedmont of Virginia between the North Carolina border and Roanoke River were mapped in considerable detail. This study, which relied entirely on road surveys, is presented as an example of a simple biogeographical project that can be conducted by both scientists and amateur naturalists.

Key words: sweetgum, distribution, phytogeography, Virginia.

Like any other field of knowledge, biogeography progresses from the general to the specific. At one time both collectors and scientists were content with simply a continental provenance for specimens (and even then, often got it wrong). As time passed, precision increased owing both to improved maps and greater appreciation of distributional phenomena. Now it is customary to cite degrees, minutes, and seconds on specimen labels and in databases, and satellite technology is available to focus down even closer. As the system of public roads has expanded during the past century in North America, there are few places left in Virginia more than a mile or two away from easy access by an automobile. It is now possible for anybody so inclined to pursue the details of geographic distribution of plants, for instance, down to the location of individual organisms. And while this may at first seem to be an exercise into the limits of trivia, some interesting information can be obtained as a product of learning more and more about less and less. The following essay is offered in support of the premise that data accumulation can be fun as well as compulsive.

An ideal subject for the study of local microdistribution would possess several characteristics: (1) abundance and conspicuousness (a large perennial plant is better than most animals for obvious practical reasons), (2) the species selected should be easy to identify, with no possibility for confusion with any local relatives, (3) it should be in either the expansion or contraction phase of its chorographic history, and (4) within the study area, the species should have a recognizable boundary. The common sweetgum tree (*Liquidambar styraciflua* L.) fulfills all of these requirements in Virginia (although it would not satisfy #4 in Mississippi, Kentucky, or Tennessee, where it is completely statewide). In characters of the leaves, fruits, and stems, sweetgum cannot be mistaken for anything else in its range (making data accumulation possible even in the winter), and there can be no doubt that in Virginia the species is currently expanding its range rapidly westward across the Piedmont, as will be demonstrated in a subsequent paragraph.

I started thinking about sweetgum during the late 1940s, when I was a student at the University of Virginia and was impressed by how abruptly one came into its area while driving east toward Richmond or northeast toward Washington. For some decades, information was slowly accumulated in a very unsystematic way, as dots on road maps, notes in field journals, and simply in the memory bank (neural, not electronic). At last, on becoming a staff member at VMNH, I had not just more opportunities to conduct field work in the Piedmont, but an actual obligation to get out and investigate that generally neglected part of the state. At first, while driving to or from some site, then later as something specific to do for its own reason, work with sweetgum gradually became more and more intriguing and finally took on a life of its

[1]Deceased

own. At present, I think the status of this tree in Virginia south of the Roanoke River has been pretty thoroughly defined and this much information may be of interest to general naturalists. Later I will present the results of mapping still further northward, between the Roanoke and James rivers, and then from the James to the Potomac. Substantial progress has been made in these areas, and the work goes on currently.[2] Unfortunately, the same cannot be said for extreme southwestern Virginia, where observations so far suggest a pattern of random disjunctions: populations reflecting condensation rather than expansion, and not correlated with anything logical. That area will take longer to interpret, and locality records are much needed.

There is not much published information about the inland occurrence of sweetgum in Virginia. The in-state distribution is shown in very general terms (one large dot per county) in the Virginia flora atlases (Harvill et al., 1992; Virginia Botanical Associates, 2012). An interesting early record is in a paper about Virginia Orthoptera (Fox, 1917), which mentioned the species (and willow oak) around Orange and Gordonsville, and presciently associated both with the "lower Piedmont" biota.

It is much to be hoped that readers of this account will enlist in the crusade to draw the line and provide data from their own observations. Sweetgum watchers should observe the procedures and caveats set out in the next paragraph.

MATERIALS AND METHODS

I have plotted observations solely on a copy of the DeLorme Atlas & Gazetteer for Virginia (1989), although in retrospect far more detail could have been registered on USGS 7.5" quadrangles. Still, the DeLorme maps allow for a plotting accuracy of down to approximately 100 meters. Sightings have been made entirely by road cruising. Sweetgum is so distinctive that, with a little practice, one can spot even small specimens while driving slowly, either from foliage, the conspicuous fruit, the winged twigs, and even a distinctive *Gestalt* when the leaves are off. All cases of doubt (occasional red maples may be deceiving at a glimpse) have been checked "on foot." I systematically drove on east-west trending state secondary roads, preferentially from west to east, alert for the first sighting. This being confirmed and entered on the map, the car was turned around and driven slowly westward beyond the site to double-check the location. Every westernmost dot shown on the map has been checked in this manner, many of them several times. In time, one develops a line showing the inlandmost occurrence of sweetgum on every relevant county road, to an accuracy of 100 meters or less. The "sweetgum line" has turned out to be irregular, capricious, and unpredictable, with frequent lobes, lacunae, and disjunctions. The lobes are frequently associated with water courses. In many places, the line may be locally vague owing to extensive clearing and cultivation; in such cases one relies upon extrapolation and uses a dashed line instead of a solid one. I have no idea how the seeds are dispersed: but would guess by wind because of their small size.

Obviously trees in someone's front yard may NOT be registered. A disjunct record needs to be checked carefully; sometimes traces of a former residence may be found in explanation. It would really be preferable for two or more persons to conduct such surveys, one doing the driving and the others observing and marking the map. Weekdays seem to be preferable to weekends for these types of surveys due to generally lower traffic volume on rural roads.

In the following commentary, "Rt." refers to roads in the county system, usually a 600 or 700 number in Virginia; often a higher number in North Carolina. Federal highways are prefixed US; state routes by VA or NC.

NORTH CAROLINA

Rockingham Co.: The boundary crosses US Hwy. 220 immediately west of Stoneville, ca. 1.5 km south of the NC Rt. 770 interchange. Sweetgum is generally distributed in the city of Eden, and crosses the state line into Virginia north of Draper along VA Rt. 856 (Pittsylvania Co.). There is also a small lobe into Virginia along the Smith River north of Eden, noted under Henry County. The distribution of sweetgum in the northcentral part of Rockingham County remains to be worked out; it is obviously in the Matrimony Creek drainage, but not seen along Garrett Road (NC Rt. 1501) where it crosses that stream just west of Eden.

VIRGINIA

Henry Co.: I have been able to locate only three small populations of sweetgum in this county, all of them just north of the state line. One is ca. 3.5 km southeast of Ridgeway, where VA Rt. 637 crosses a small tributary to Matrimony Creek; the second is at the intersection of VA Rts. 632 and 884 (Stuart Creek); the third consists of a few scattered trees south of Sandy Level, in the extreme southeastern corner of the county along VA Rt. 610.

[2]Editor's note: Parts 2 and 3 of Dr. Hoffman's sweetgum study will not be completed or published due to his death.

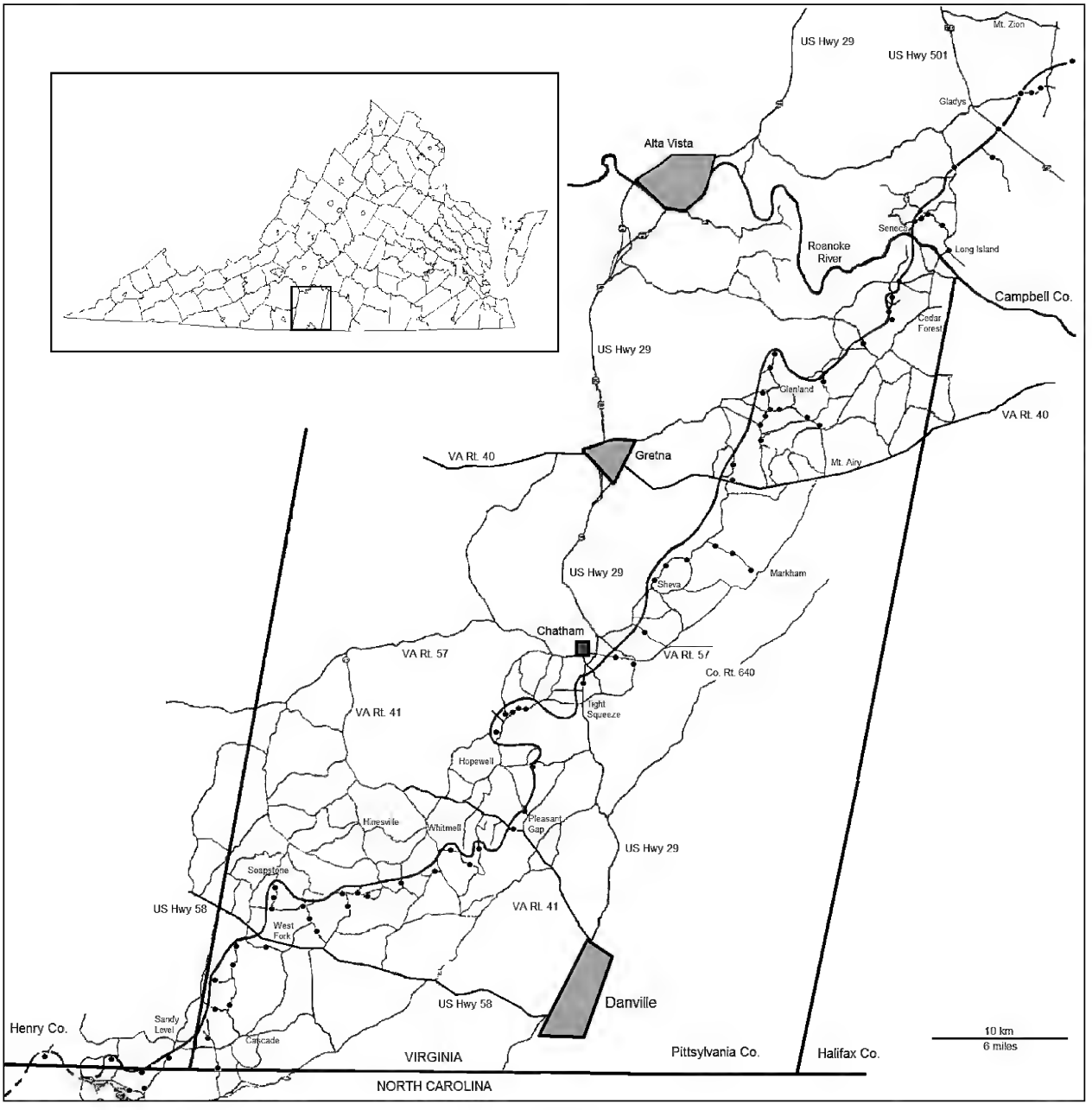

Fig. 1. Extent of inlandmost occurrence of sweetgum (*Liquidambar styraciflua*) in Virginia from the North Carolina border north to (and slightly beyond) the Roanoke River. All federal and state highways are indicated and selected county roads are shown but not labeled (except Co. Rt. 640). Points (three in Henry Co., 59 in Pittsylvania Co., and 12 in Campbell Co., plus three on the northern outskirts of Eden, NC) indicate the author's observational limits along public roads. The meandering solid line running from southwest to northeast is the inferred western distributional limit of the species. The rectangle in the inset map shows the study area.

From that point the line crosses over into Pittsylvania County.

Pittsylvania Co.: The line appears to be fairly straightforward, extending north-northeast along Cascade Creek, and crossing US Hwy. 58 about 100 meters east of its junction with VA Rt. 855. A prominent north-south ridge here seems to be the definitive boundary. From here, the line turns more distinctly eastward toward Chatham, just west of Whiteoak Mountain, making a notable westward lobe up the Banister River basin. US Hwy. 29 is crossed just at the southern edge of Chatham, at the junction with Business US Hwy. 29. North of Chatham, the line runs just west of Sheva and Chalk Level, crossing VA Rt. 40 about 100 meters east of its junction with VA Rt. 856. The Roanoke River (and northern edge of the county) is crossed immediately east of the mouth of Seneca Creek, into Campbell County.

Campbell Co.: Sweetgum is not present along Seneca Creek itself, turning eastward again to cross US Hwy. 501 about 3 km south of Gladys. Beyond this point, there is still ambiguity and uncertainty to be resolved.

GENERAL OBSERVATIONS

There can be no doubt that sweetgum is, in the Virginia Piedmont, an aggressive and successful pioneer species. All along "the line" as here mapped (Fig. 1)[3], seedlings and young trees are usually abundant at the westernmost observed sites, especially evident in cleared fields, roadside embankments, and disturbed areas in general. Further to the east, the species seems to become assimilated into local tree communities and is rarely a dominant or competitive element. I have been unable to discern any particular preference for habitat type: hot exposed fields and moist shaded bottomlands seem to be occupied with equal success.

In my opinion, sweetgum is, in central Virginia, an austral species vigorously expanding its range westward and northward. It will be of considerable interest to continue observations into the future. How long until it gets to Martinsville and Lynchburg, or to the Blue Ridge? Drawing the line again in 50 years will surely reveal some measureable progress.

[3]Map prepared by Steve Roble, *Banisteria* editor, based on Dr. Hoffman's annotated photocopies of selected pages from the Virginia Atlas & Gazetteer. His maps will be archived at the Virginia Museum of Natural History, Martinsville, VA for possible use by future researchers.

It should not be anticipated that conditions further north, particularly across the James River, will be so readily circumscribed. Already I have discovered some vexing disjunctions, well to the west of the obvious "line", and in Fluvanna County, for instance, there are major, unexpected, westward displacements of the boundary. These will be mapped and discussed in the second part of this ongoing treatment.

Unlike the situation in the southern Piedmont, my observations in southwestern Virginia have not yet identified a distinctive "front" that can be represented by a line on a map. Rather, known occurrences of sweetgum are sporadic and disjunct, often along major streams but just as often removed at some distance from them. The impression one gets is that of a highly fragmented distribution, with little or no expansion occurring presently, and no way to anticipate where additional small populations may be located. Obviously, a long time will pass before the situation in that region is worked out.

Lastly, it might be noted that a remarkably similar westward line could be drawn in the southern Piedmont for willow oak (*Quercus phellos* L.), although that line would typically be one to several kilometers west of the sweetgum line. Regrettably, I failed to notice this situation at an early stage, and am now too burdened with other things to go back over the ground and accumulate data *de novo*. Someone should, because willow oak has the same traits that make sweetgum an easy subject. Both appear to be marching to the same drummer, but at slightly different tempos.

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Banisteria, Number 40, pages 36-41

Observations on the Distribution, Habitat, and Seasonality of the Centiped *Scolopocryptops sexspinosus* (Say) in Virginia (Scolopendromorpha: Cryptopidae)

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ABSTRACT

Scolopocryptops sexspinosus is a common, widespread centiped in Virginia, occurring from sea level to the highest mountain in the state. It exhibits local habitat preferences, such as occupying hardwood forests to the near exclusion of pine plantations, mature hardwoods as opposed to old growth forests, and coastal mesic and dune habitats in favor of maritime scrub. Adults are active throughout the year with peak captures statewide recorded during July and September. Differences in seasonal activity patterns between populations are apparent, presumably due to variation in elevation and climate (temperature). Seasonal activity may also vary within populations, likely as a result of local moisture differences. Pitfall trapping is an effective technique for capturing this large, formidable species in numbers.

Key words: centiped, Chilopoda, Virginia, distribution, habitat, seasonal activity.

INTRODUCTION

Scolopocryptops sexspinosus (Say) is Virginia's largest centiped and perhaps the one most often seen by humans. It is a species of leaf litter and rotting logs, with old adults attaining lengths of 65 mm (2.6 inches). The color is somewhat variable, but typically orange to orange-red, rarely reddish-brown. The species is blind (lacks ocelli), possesses 23 pairs of legs, and can deliver a painful bite if handled (Shelley, 1987). During the summer months, brooding females are often discovered under bark or in damp rotting wood (Shelley, 2002), coiled about their eggs or recently hatched young, which they protect from potential predators, and possibly also fungal growth (Auerbach, 1951). Females attending up to 65 embryos were reported by Auerbach (1951), who noted that prey consists of insects, earthworms, spiders, and smaller centipeds.

Despite its large size and virtual ubiquity over much of eastern North America, very little has been published about the general biology of *S. sexspinosus*. The few published notations are generally no more than anecdotal observations made during field work; so far nothing quantitative has appeared. Most museum material consists of single individuals picked up by people primarily interested in other taxa; extensive series are exceptional. This species is far more common than museum records imply, perhaps because collectors not equipped with forceps are reluctant to attempt hand-capture of these swift-moving centipeds that are capable of inflicting a painful bite.

Pitfall trapping is an extremely effective way to obtain

*Deceased

S. sexspinosus in quantity, and the widespread use of this technique in Virginia in recent decades provided the materials necessary to examine such aspects of its biology as distribution, seasonality, and habitat preference.

MATERIALS AND METHODS

Distributional and seasonal data are available for 676 Virginia specimens of *S. sexspinosus*, and associated habitat data exists for about half that number. The majority is housed in the Virginia Museum of Natural History, and represents extensive series obtained by the use of pitfall traps in various patterns (usually two to four buckets in each drift fence-pitfall array) typically operated on a monthly pickup basis, although in some sites specimens were collected at two-week intervals. These traps were operated by staff of the Virginia Museum of Natural History, personnel of the Virginia Department of Conservation and Recreation, Division of Natural Heritage (VDNH), and individual investigators, among whom Dr. Joseph C. Mitchell is particularly noteworthy. Additionally, Dr. Rowland M. Shelley of the North Carolina State Museum of Natural Sciences generously provided RLH with an extensive list of Virginia specimens of *S. sexspinosus* examined by him in many American museums.

CHOROLOGY

Scolopocryptops sexspinosus is generally distributed over much of eastern North America (Shelley, 2002; Fig. 1, inset map), from the Gulf Coast to southern Canada (known only from Niagara Gorge, Ontario; Shelley, 1992). It occurs as high as 6400 ft/1950 m on Waterrock Knob in western North Carolina. This ubiquity is reflected in the narrower context of Virginia (Fig. 1), with captures made from sea level to the Fraser fir (*Abies fraseri*) forest on Mount Rogers at more than 5700 ft/1740 m. An earlier account (Hoffman, 1995) noted the lack of records for *S. sexspinosus* from the two Eastern Shore counties, but we subsequently collected this species at the Savage Neck Dunes Natural Area Preserve near Eastville in Northampton County.

The statement by Shelley (1987: 507) that "In any part of North Carolina, urban or rural, one can hardly spend 15 minutes sifting through litter or turning over logs without encountering one of these centipedes" applies precisely to the situation in Virginia. The species is surely statewide, and undoubtedly occurs in every county and city with the possible exception of the Dismal Swamp area in Suffolk and Chesapeake cities, and in most of adjoining Virginia Beach. That this lacuna may be real, rather than a collection bias, is suggested by a corresponding blank space in adjacent northeastern North Carolina (Shelley, 1987, fig. 15).

HABITAT

Previous reports concerning the preferred habitat of *S. sexspinosus* seem to be contradictory. In Illinois, the species was found in late winter in decayed logs, under bark, and in soil, whereas it was only collected in soil during summer (Auerbach, 1949). This centiped is usually difficult to find, occupying moist, inaccessible habitats

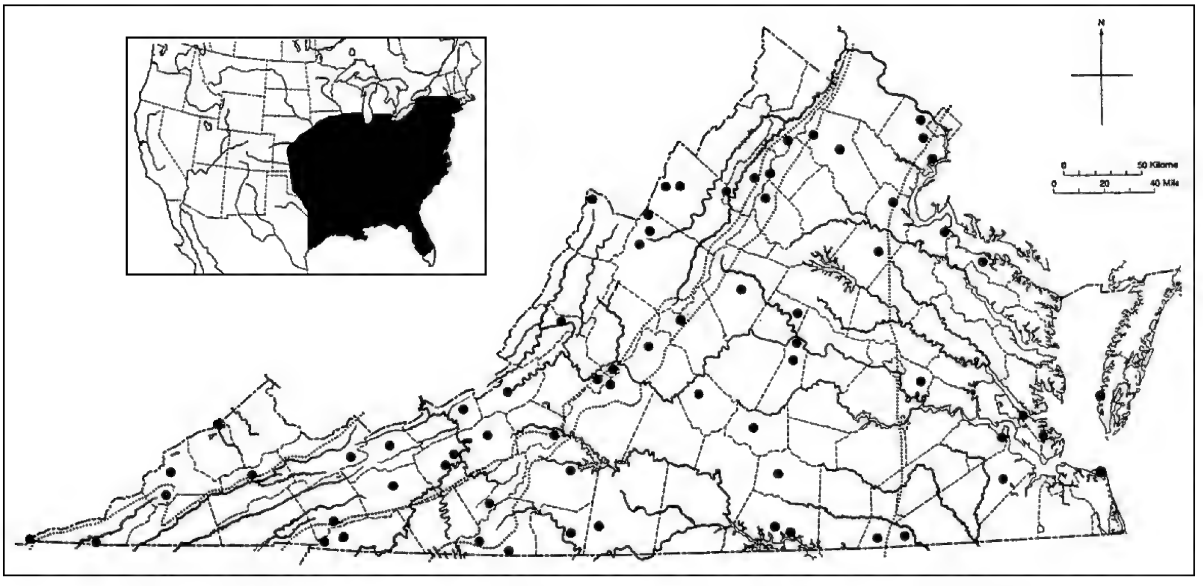

Fig. 1. Distribution of *Scolopocryptops sexspinosus* in Virginia. Inset map is based on Shelley (2002).

such as deep within rotting logs or stumps, but during the breeding season or after prolonged rains, it may be common under pieces of wood or bark, leaf litter, and rotting logs (Auerbach, 1951). Perhaps owing to its large size, Auerbach found that *S. sexspinosus* was more tolerant of desiccation than the other species of centipeds he tested. In Kentucky, *S. sexspinosus* was common under rotting logs (Branson & Batch, 1967; n = 16 captures), whereas it was collected exclusively in leaf litter in upland habitats in Illinois (Summers & Uetz, 1979; all 20 captures in pitfall traps). All specimens (n = 63) found by Lee (1980) in Ohio were under the bark of dead trees (i.e., none were taken in leaf litter), with most (80%) captured in deciduous forests (oak, maple, beech, hickory) and the remainder (20%) in coniferous forests. This centiped occurs statewide in North Carolina, where it is usually found in moist litter (deciduous or pine), but some individuals are also observed under rocks and logs (hardwood or pine), though rarely under the bark of decaying logs (Shelley, 1987).

In Virginia, *S. sexspinosus* occurs in a wide variety of habitats: under large stones (rarely), in leaf litter and detritus, and most frequently inside rotting logs in mixed mesophytic forests (RLH, pers. obs). It is rarely found under loose bark of downed trees unless on a damp, rotting log. The frequency of pitfall captures implies that it must be very surface active, but RLH has never seen one exposed on the surface either during the day or night despite more than 60 years of night collecting for salamanders and millipeds! And we have no records for its entry into houses or biting anyone, in contrast to the similar-sized *Hemiscolopendra marginata* (Say), which only rarely is caught in pitfalls but frequently invades homes and bites the occupants without provocation (Hoffman, 1994).

Despite the apparent catholicity of habitat selection by *S. sexspinosus*, collection data from several sites in Virginia demonstrate that under some local conditions, habitat preferences are clearly evident. The following examples are instructive:

First Landing (formerly Seashore) State Park

At this park, located at Cape Henry, City of Virginia Beach, VDNH operated pitfall-drift fence arrays for a 15-month period (March 1989-May 1990) in three different habitats. Captures of *S. sexspinosus* indicated preference for mesic habitats and a near-total avoidance of scrub (Fig. 2; $X^2 = 65.44$, $P < 0.001$). The general facies of the three habitats are as follows (abstracted from Buhlmann et al., 1993):

"Mesic site": A natural, pristine forested tract dominated by oaks (*Quercus* spp.), loblolly pine (*Pinus taeda*), red maple (*Acer rubrum*), and black gum (*Nyssa sylvatica*); the ground is often saturated and remains wet nearly year-round.

"Dune site": an upland forest of mixed oaks and loblolly pine on an old dune ridge; about 100 m from the nearest standing water.

"Scrub site": located in upland sandy ridges with forest cover of bluejack oak (*Quercus incana*) and loblolly pine and understory of blueberry (*Vaccinium* sp.); nearest standing water about 100 m distant.

Of the 129 specimens trapped at these sites, 80 (62%) were from the mesic site, 44 (34%) from the dune site, and only five (4%) from the scrub. Clearly, some unidentified constraints are present in this last habitat, although nothing different is evident from the brief site descriptions except for the occurrence of an ericaceous understory. Perhaps these plants reflect a lower soil pH to which the centipeds are sensitive. Habitat selection could be investigated by giving captive specimens a choice of several substrates identical except for one variable, such as soil pH, temperature, moisture, etc.

Cumberland County

From September 1989 through September 1990, J. C. Mitchell conducted pitfall trapping at several localities in the northern end of Cumberland County, Virginia, just south of the James River at Columbia in the central Piedmont region of the state (see Hoffman et al., 2012). Duplicate pitfall arrays were placed in two of three habitats:

a. Relatively undisturbed mature hardwood stands, composed largely of red maple, tulip poplar (*Liriodendron tulipifera*), white oak (*Quercus alba*), American beech (*Fagus grandifolia*), and sweetgum (*Liquidambar styraciflua*).

b. Old field communities in early successional stages, three to six years following clearcut lumbering. completely without canopy, with a ground cover of grasses, forbs, vines, shrubs, and planted seedlings of loblolly pine.

c. A pinewoods stand composed almost entirely of planted loblolly pine with an understory of dogwood (*Cornus florida*) and thick groundcover of pine needles. Only one pitfall array was employed in this habitat.

A small stream was present at each of the hardwood stands, and a small seepage area in one of the old field sites.

Captures of *S. sexspinosus* indicated strong preference for hardwoods and total avoidance of pine (Fig. 2; $X^2 = 214.57$, $P < 0.001$). Of the 189 specimens trapped at these sites, 156 (83%) were from the hardwood forest sites and 33 (17%) from old field/clearcut sites, with no captures

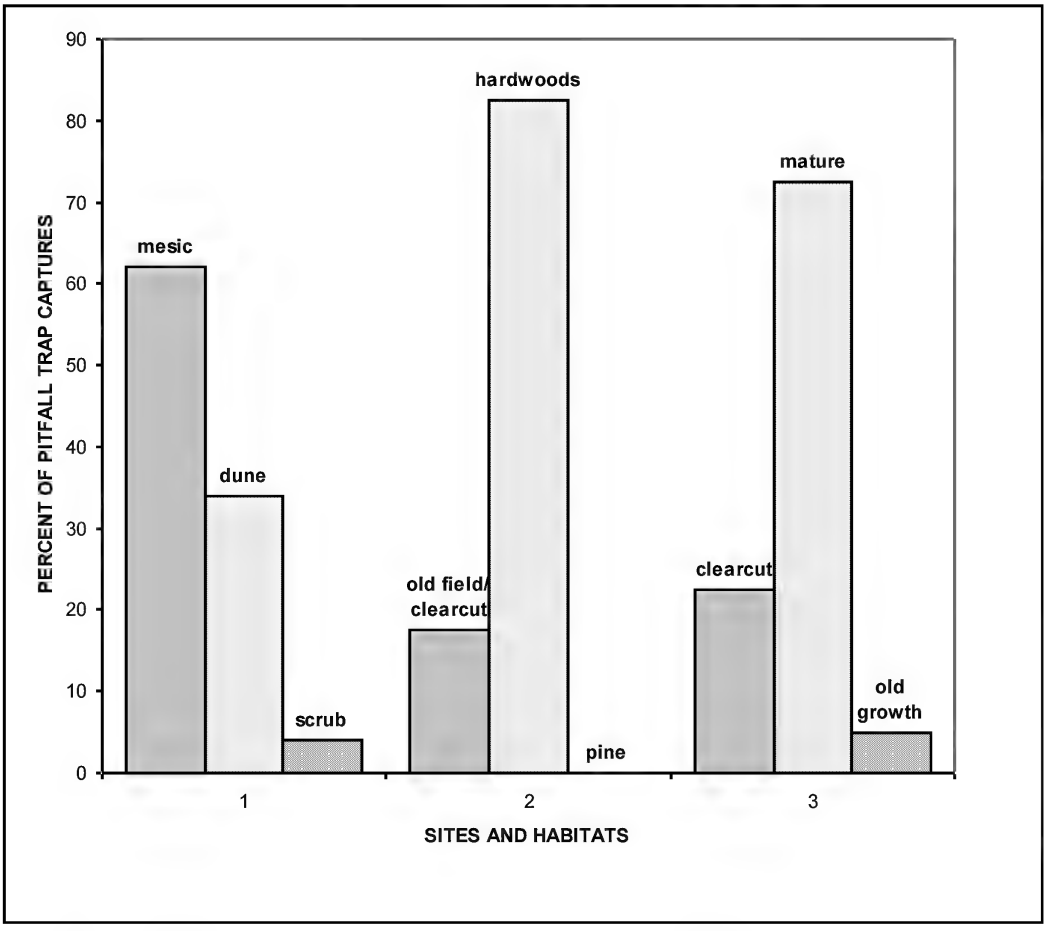

Fig. 2. Pitfall trap captures of *Scolopocryptops sexspinosus* in different habitat types at three study sites: 1. First Landing State Park, City of Virginia Beach (n = 129). 2. Cumberland County (n = 189). 3. Augusta County (n = 40). See text for study site descriptions.

recorded from the loblolly pine forest. All of the old field/clearcut captures were in the southern replicate (i.e., none in the northern replicate).

Augusta County

From September 1988 through September 1989, B. R. Flamm operated pitfall-drift fence arrays at 10 sites on Shenandoah Mountain in the George Washington National Forest in an area about 5 miles/8 km west of Stokesville, Augusta Co., Virginia (Flamm, 1990). Three habitat types were sampled: clearcut (2 years postcut), mature forest (mostly red oaks, stand age ca. 70-73 years), and old growth forest (mostly red oaks, stand age $\geq$138 years). Of the 40 specimens of *S. sexspinosus* obtained during this study which had associated habitat data, 29 (73%) were captured in mature forests, with a near-total absence (only 2 captures [5%]) from old growth forests (Fig. 2; $X^2 = 42.12$, $P < 0.001$).

SEASONALITY

Specimens of *S. sexspinosus* have been captured in Virginia in every month of the year (Fig. 3). Statewide, the combined data for 676 specimens reveals that the peak capture month was July (n = 136, of which 104 were from the Columbia County study sites), with the second highest total in September (n = 92). At least 50 specimens were captured in five other months (March, April, August, October, and November). Not surprisingly, the fewest captures were obtained during December, January, and February, the coldest months of the year.

Comparing the capture data for the three study sites discussed above, there were pronounced differences in seasonal activity patterns associated with the differences in elevation and climate. At First Landing State Park, a coastal site with the mildest climate, specimens were taken year round, with peak collections in March, fewest captures in September and October, and then a slight

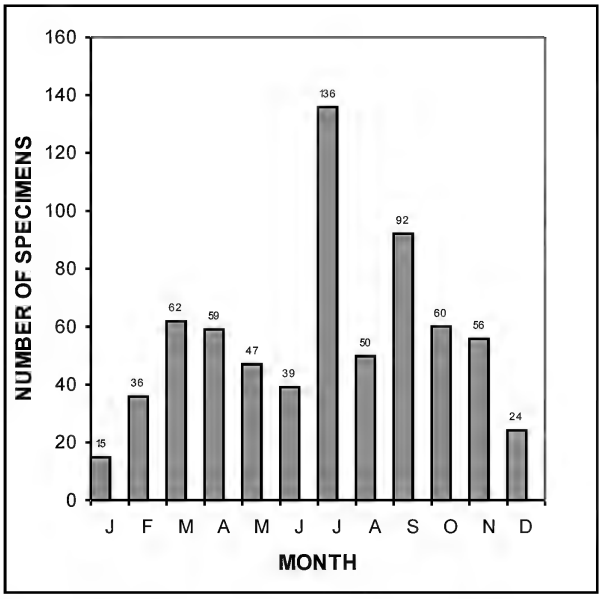

Fig. 3. Seasonal activity of *Scolopocryptops sexspinosus* (n = 676) in Virginia based on collection dates of all available specimens.

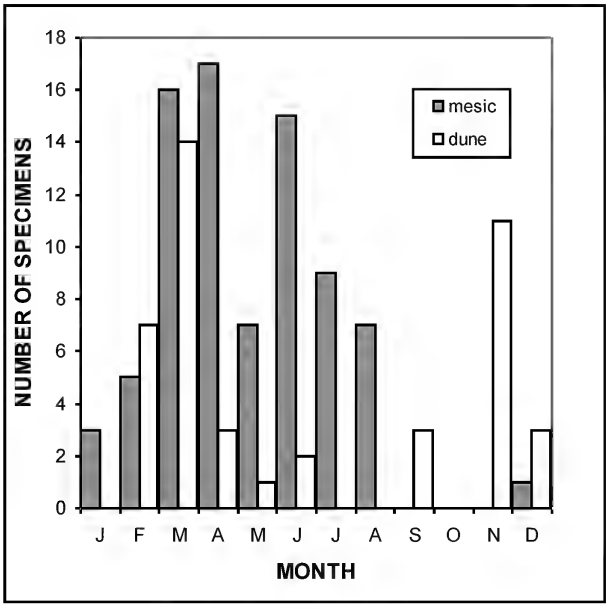

Fig. 5. Seasonal activity of *Scolopocryptops sexspinosus* in two habitats at First Landing State Park, City of Virginia Beach, based on pitfall trap captures (March 1989-May 1990).

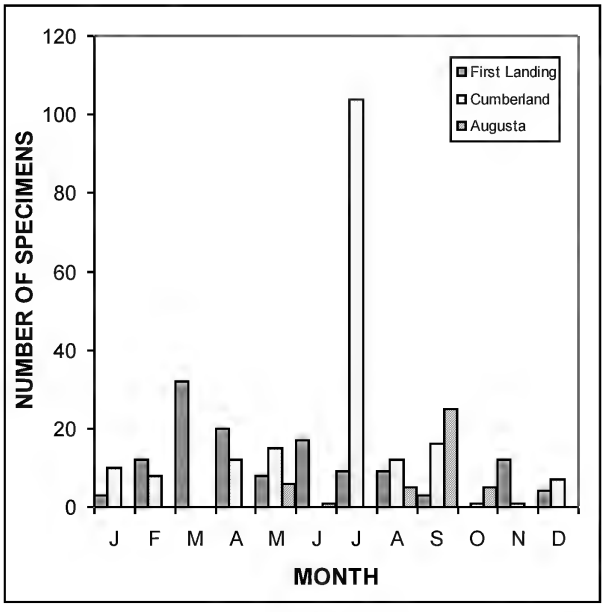

Fig. 4. Seasonal activity of *Scolopocryptops sexspinosus* at three study sites in Virginia based on pitfall trap captures. See text for study site descriptions, locations, and survey dates.

increase in November and December (Fig. 4). The Cumberland County sites are in the Piedmont at elevations of 200-400 feet (60-120 m). At these sites, specimens were captured in most months of the year, but there was a very sharp peak during July, when more than half (56%) of all specimens were captured (Fig. 4). The Augusta County study sites are in the Ridge and Valley region of Virginia at elevations of 2000-2600 feet (610-793 m), thus experiencing the coldest climate of the three areas under comparison. Here, specimens of *S. sexspinosus* were only captured between June and October, with the peak month being September, when 25 of 42 total specimens (60%) were taken in pitfall traps.

At First Landing State Park, where *S. sexspinosus* predominantly inhabited two of the three rather different biotopes, somewhat different seasonality patterns are evident at a finer scale (Fig. 5). At the mesic site, damp nearly year-round, specimens were trapped from December to August, with a numerical peak in March (16) and April (17). At the dune site, captures made concurrently suggest bimodality, however, with the maximum numbers in March (14) and November (11). Very few (n = 9) were taken between April and mid-October (none in July and August), perhaps reflecting drier summer conditions and less surface activity.

DISCUSSION AND CONCLUSIONS

As a concluding observation, one set of data (Table 1) potentially raises concern over the impact of ongoing static collecting protocols. From March to December 1989, 100 individuals of *S. sexspinosus* were removed from the population at First Landing State Park, nearly half of which (46) were captured between March and

Table 1. Monthly captures of *Scolopocryptops sexspinosus* in pitfall traps at First Landing State Park, City of Virginia Beach.

Year	J	F	M	A	M	J	J	A	S	O	N	D
1989	-	-	25	14	7	17	9	9	3	0	12	4
1990	3	12	7	6	1	-	-	-	-	-	-	-

May. Only 14 were taken during those same months the following year, including a single capture in May 1990 when the trapping program was concluded. The absence of *S. sexspinosus* from the numerous pitfall trapping operations conducted elsewhere, and concurrently, in the City of Virginia Beach suggests that this species may survive there as an isolated enclave in First Landing State Park. Perhaps a follow-up sampling program could be designed to monitor the current population without inflicting further depletion.

The results of this study reveal that *S. sexspinosus* is common and widespread in Virginia, but the species appears to exhibit local habitat preferences. Adults are active throughout the year with peak captures statewide recorded during July and September. Local differences in seasonal activity patterns were apparent at selected study sites, presumably due to elevation and climate (temperature) at a broader scale and perhaps moisture gradients at a finer scale.

ACKNOWLEDGEMENTS

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New and Additional Records of Ground Beetles and Wrinkled Bark Beetles for Virginia (Coleoptera: Carabidae, Rhysodidae)

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ABSTRACT

Three ground beetles (Carabidae), *Dyschirius erythrocerus* LeConte, *Badister f. flavipes* LeConte, and *B. grandiceps* Casey, and one wrinkled bark beetle (Rhysodidae), *Clinidium apertum allegheniense* Bell & Bell, are reported from Virginia for the first time. Specimen data also are presented for five species, *Pasimachus punctulatus* Haldeman, *Dyschirius larochellei* Bousquet, *D. pallipennis* (Say), *Agonoleptus rotundicollis* (Haldeman), and *Agonum rufipes* Dejean, recently added to the Virginia carabid list (without details) in Bousquet's (2012b) revised North American checklist. Additional records are provided for *Tachys oblitus* Casey, first reported for Virginia by Hoffman (2010). *Cicindela puritana* Horn is removed from the Virginia list due to a lack of records. The number of carabids (530) and rhysodids (5) recorded from the state now totals 535 taxa (528 species and seven subspecies).

Key words: beetle, Carabidae, Rhysodidae, Coleoptera, Virginia.

INTRODUCTION

The varied habitats in the Commonwealth of Virginia support a diverse ground beetle (Carabidae) fauna, now known to exceed more than 500 species, with the total continuing to increase with additional sampling, curatorial efforts, taxonomic revisions, and descriptions of new species. Hoffman et al. (2006) added 30 species and one subspecies to the state list, raising the total to 500 species and seven subspecies (reported as 506 "species"). We have since determined that one of these species, *Loxandrus brevicollis* (LeConte), had been reported from Virginia in an earlier paper (Anderson et al., 1995) in this journal. Also, some additional prior literature had been overlooked. Bousquet (1996) cited a Virginia Beach specimen of *Oodes americanus* Dejean and Will & Liebherr (1997) described *Loxandrus icarus* from Virginia. The latter authors also synonymized *L. inferus* Allen with *L. velocipes* Casey, both of which had been listed for Virginia by Bousquet & Larochelle (1993). Will (1999) added *Lophoglossus vernix* Casey based on a USNM specimen bearing a state label only. Hieke (2000) reported *Amara ovata* (F.), an introduced species, from Shenandoah County, resurrected *A. flebilis* (Casey) from synonymy with *A. angustata* (Say) (and provided VA records for both), and noted that he had examined specimens of *A. littoralis* Dejean from every (continental) state and province in North America (no details of any VA records were provided). The latter species had been recorded by Bousquet & Larochelle (1993) from 37 states and 12 provinces, but not Virginia. Bousquet (2012b) listed *A. littoralis* from 47 states, including Virginia. Sokolov et al. (2004)

*Deceased

described 17 new species of the forest litter-inhabiting genus *Anillinus* from the southeastern United States, including *A. erwini* from the mountains of western North Carolina and southwestern Virginia.

Hoffman et al. (2006) corrected several errors of relevance to Virginia contained in the North American carabid list compiled by Bousquet & Larochelle (1993), but they failed to note that *Cicindela puritana* Horn (= *Ellipsoptera puritana* [Horn]) was incorrectly attributed to the state by these authors (as well as Bousquet, 2012b). All historical and current Chesapeake Bay populations of this federally threatened species (Puritan Tiger Beetle) are confined to the Maryland portion of the Bay (Knisley & Schultz, 1997). There are no known specimen records from Virginia.

Sixteen additional carabids, including one introduction and eight species new to science, were reported from the state through mid-2012. Species recently described from southwestern Virginia include *Pterostichus barri* (Bousquet, 2006b), *Serranillus septentrionis* (Sokolov & Carlton, 2008), and *Maronetus hoffmani* (Barr, 2009). Bousquet & Webster (2006) described the widespread (New Brunswick and Quebec south to Virginia) species *Bembidion iridipenne* and listed paratypes from Highland County. Maddison (2008) described four new species of *Bembidion,* of which two, *B. arenobilis* and *B. rothfelsi*, are known from Virginia. He also resurrected *B. antiquum* Dejean from synonymy of *B. chalceum* Dejean and plotted Virginia records for both. Subsequently, Maddison (in Maddison & Arnold, 2009) described eastern populations of *B. aenulum* Hayward as the new species *B. paraenulum*. More recently, Bousquet (2012a) described *Platynus daviesi* (type locality is in Shenandoah National Park) as a species distinct from *P. parmarginatus* Hamilton. The new species inhabits the Appalachian Mountains from Connecticut to northwestern Alabama, whereas southwestern Pennsylvania is the nearest record to Virginia for *P. parmarginatus*.

Platynus opaculus LeConte was first documented in Virginia during the 2006 Potomac Gorge Bioblitz (Evans, 2008). *Calosoma sycophanta* L., an Old World species that was introduced to northeastern North America nearly a century ago to control gypsy moth populations, has become established in northern Virginia (Carrington, 2002; Evans, 2009). Finally, Hoffman (2010) added five species to the state's fauna based on recent collections from Quantico Marine Corps Base. One of these, *Lebia atriceps* LeConte, is a western species captured far out of range, presumably the result of anthropogenic transport. A summary of the various additions and deletions to the Virginia carabid list since the records presented in Hoffman et al. (2006) appears in Table 1.

A revised and greatly expanded checklist of North American Trachypachidae (three western species), Rhysodidae (wrinkled bark beetles; eight species), and Carabidae (2,428 species) was recently prepared by Bousquet (2012b). He cited records for 531 taxa in Virginia (520 native and 11 adventive, exclusive of *Lebia atriceps*), thus ranking it fifth among all states and provinces on the continent, trailing only Texas (693 native and one adventive), California (646 + 12), North Carolina (536 + 4), and New York (528 + 21), and tied with Ontario (510 + 21). The Virginia total (527 carabids and four rhysodids) represents 20% of the native North America fauna (Bousquet, 2012b). The previous checklist (Bousquet & Larochelle, 1993) tallied 446 taxa for Virginia, ranking it 14th among all states and provinces at that time. Thus, the known carabid fauna of Virginia increased by 19% during the past two decades, primarily as a result of additional field sampling. Bousquet's (2012b) new compilation added 15 species (and one subspecies) to the Virginia list, removed three others, and questioned the status of four more (Table 1). Taxonomic changes also accounted for some name swapping or additions and deletions to the state list.

In this paper we report three ground beetles and one wrinkled bark beetle new to the Virginia fauna, thus increasing the documented total for both families to 535 taxa (528 species and seven subspecies), including 530 carabids and five rhysosids. Furthermore, the troglobitic cave beetle genus *Pseudanophthlamus* contains 148 recognized species, of which 31 occur in Virginia, including 28 endemics (Barr, 2004). Barr (2004) noted that he had studied material representing approximately 80 additional, undescribed species in this genus, 9 or 10 of which occur in Virginia (T. C. Barr, pers. comm., 2008). With the passing of Dr. Barr on 29 April 2011, and in the absence of an obvious successor to fill the void, it may be decades before these species are formally described and officially added to the Virginia carabid list, which will undoubtedly surpass 550 species.

In the accounts below we follow the sequence and nomenclature of Bousquet (2012b). VDNH signifies specimens captured during surveys made by personnel of the Division of Natural Heritage, Virginia Department of Conservation and Recreation. UV indicates capture with blacklight (ultraviolet light), either at sheet or with a bucket trap, and DF signifies a drift fence-pitfall trap array. Unless otherwise specified, all specimens cited in the species accounts were determined by RLH and are in the collection of the Virginia Museum of Natural History (VMNH).

RHYSODIDAE

Bousquet (2012b) noted that more than 90% of the approximately 355 species worldwide inhabit the Southern Hemisphere. He listed four species from Virginia: *Omoglymmius americanus* Laporte, *Clinidium balduf*i Bell, *C. rosenbergi* Bell, and *C. sculptile* Newman. The known ranges of other members of this family (Bell & Bell, 1985) suggested that two additional species might occur in Virginia, one of which is now confirmed:

Clinidium apertum allegheniense Bell & Bell
NEW STATE RECORD

Cumberland Co.: 2 km SW of Columbia, hardwoods north (DF), 16 July 1990, J. C. Mitchell (1; det. A. V. Evans). *Henry Co.*: 2 mi SW of Irisburg, Smith River, Va. Rt. 636, 16 May 1993, R. L. Hoffman (1).

This beetle was previously known from southwestern Pennsylvania and Mount Mitchell, North Carolina (Bell & Bell, 1985; Bousquet, 2012b). An earlier report from Ohio requires confirmation (Bousquet, 2012b). Both Virginia records are from the Piedmont region of the state.

Clinidium valentinei Bell inhabits the Appalachian Mountains from southwestern Pennsylvania to north-central Alabama and northeastern Georgia (Bell & Bell, 1985; Bousquet, 2012b), but it has not yet been documented in Virginia.

CARABIDAE

PASIMACHINI

Pasimachus punctulatus Haldeman

Citing Carrington's (2002) unpublished thesis, Bousquet (2012b) added this species to the Virginia list. A total of 28 specimens was captured during a 4-year pitfall trapping survey on the George Washington National Forest in Augusta County (Carrington, 2002).

VMNH has 20 specimens of *P. punctulatus* from six sites in five counties: *Augusta Co.*: Maple Flats near Sherando [George Washington National Forest], 17 May 1988, K. A. Buhlmann (1); George Washington National Forest, 5 mi W of Stokesville, 17 June 1989 (4), 9 July 1989 (1), all B. Flamm. *Botetourt Co.*: Carvins Cove boat landing, 31 May 1994, M. Donahue (1). *Franklin Co.*: Grassy Fork Creek at Va. Rt. 619, 6 May 1989 (1), 2-30 August 2000 (1), both R. L. Hoffman. *Lunenburg Co.*: Juniper Creek at Va. Rt. 690, 4 mi N of Rehoboth, 19 June-3 July 1991 (4), 3-17 July 1991 (1), 17 July-1 August 1991 (3), all VMNH DF survey [R. L. Hoffman et al.]. *Mecklenburg Co.*: Elm Hill Wildlife Management Area, Clyde's Pond, open field, 10 July-1 August 1995 (2), 26 August-20 September 1995 (1), all VMNH DF survey [R. L. Hoffman et al.].

The range of *P. punctulatus* extends from New Jersey to Florida, west to Kansas and Texas, and south into northern Mexico (Bousquet, 2012b).

DYSCHIRIINI

Bousquet & Larochelle (1993) listed seven species of *Dyschirius* from Virginia. Hoffman et al. (2006) added *D. pumilus* (Dejean) and Bousquet (2012b) listed two more species (*D. larochellei* and *D. pallipennis*) for the state. We include VMNH records for these last two species and add one congener to the Virginia list:

Dyschirius erythrocerus LeConte
NEW STATE RECORD

City of Virginia Beach: False Cape State Park, main park road southwest of junction with Barbour Hill Trail, live oak-oblolly pine forest, 5 July 2005, uv, S. M. Roble, VDNH (1).

The known distribution of this small beetle (4-5 mm) extends from New Brunswick and Maine to South Dakota, southward to Delaware, Arkansas, and Louisiana (Bousquet, 1988, 2012b). Our specimen from False Cape thus represents a slight extension of the range along the Atlantic Coast and presages discovery of this species in North Carolina.

Dyschirius larochellei Bousquet

Accomack Co.: Assateague Island, Chincoteague National Wildlife Refuge, "cattle gate site", 10 August 1998, uv, S. M. Roble, VDNH (3).

This species was described by Bousquet (1988), who differentiated it from *D. erythrocerus* and cited records for nine eastern states (New Hampshire to Florida and Texas). Bousquet & Larochelle (1993) listed records for 10 states plus three provinces in northeastern Canada, and Bousquet (2012b) finally added Virginia to the known range but without details. It also occurs in the Bahamas, Cuba, Hispaniola, and Mexico (Bousquet, 2012b).

Dyschirius pallipennis (Say)

City of Virginia Beach: False Cape State Park, Wash Woods Environmental Education Center, 6-7 July 2005, uv, S. M. Roble, VDNH (1).

Table 1. Changes to the Virginia list of Carabidae since the report by Hoffman et al. (2006), including previously overlooked references. *Clinidium apertum allegheniense* (Rhysodidae) is also reported as new for Virginia in this paper. An asterisk after "New species" signifies that the type locality is in Virginia. B&L93 = Bousquet & Larochelle (1993).

Species	Type of record	Comments	Reference
Anillinus erwini	New species		Sokolov et al. 2004
Bembidion arenobilis	New species*	Listed as *B. arenobile* in Bousquet (2012b)	Maddison 2008
Bembidion iridipenne	New species	Replaces *B. incrematum* on list	Bousquet & Webster 2006
Bembidion paraenulum	New species*	Replaces *B. aenulum* on list	Maddison & Arnold 2009
Bembidion rothfelsi	New species*		Maddison 2008
Loxandrus icarus	New species*		Will & Liebherr 1997
Maronetus hoffmani	New species*	Placed in the genus *Scaphinotus* (subgenus *Maronetus*) by Bousquet (2012b)	Barr 2009
Platynus daviesi	New species*	Replaces *P. parmarginatus* on list	Bousquet 2012a
Pterostichus barri	New species*	Replaces *P. palmi* on list	Bousquet 2006b
Serranillus septentrionis	New species*		Sokolov & Carlton 2008
Acupalpus pumilus	Added to VA list		Bousquet 2012b
Agonoleptus rotundicollis	Added to VA list		Bousquet 2012b; this paper
Agonoleptus thoracicus	Added to VA list	Treated as a synonym of *A. conjunctus* in B&L93	Bousquet & Messer 2010
Agonum galvestonicum	Added to VA list		Hoffman 2010
Agonum rufipes	Added to VA list		Bousquet 2012b; this paper
Agonum tenue	Added to VA list		Bousquet 2012b
Amara flebilis	Added to VA list	Treated as a synonym of *A. angustata* in B&L93	Hieke 2000
Amara latior	Added to VA list		Bousquet 2012b
Amara littoralis	Added to VA list	Examined specimens from all continental U.S. states	Hieke 2000
Amara ovata	Added to VA list	Exotic	Hieke 2000
Badister flavipes flavipes	Added to VA list	New state record	This paper
Badister grandiceps	Added to VA list	New state record	This paper
Bembidion antiquum	Added to VA list	Treated as a synonym of *B. chalceum* in B&L93	Maddison 2008
Brachinus fulminatus	Added to VA list		Bousquet 2012b
Brachinus perplexus	Added to VA list		Bousquet 2012b
Bradycellus tantillus	Added to VA list		Hoffman 2010
Calosoma sycophanta	Added to VA list	Exotic; additional records in Carrington (2002) thesis	Evans 2009
Clivina acuducta	Added to VA list	Treated as a synonym of *C. americana* in B&L93	Bousquet 2009
Dyschirius erythrocerus	Added to VA list	New state record	This paper
Dyschirius larochellei	Added to VA list		Bousquet 2012b; this paper
Dyschirius pallipennis	Added to VA list	Say (1823) cited as source of VA record	Bousquet 2012b; this paper
Elaphropus saturatus	Added to VA list		Hoffman 2010
Lebia atriceps	Added to VA list	Western species far out of range, probably as a result of anthropogenic transport to a military base	Hoffman 2010
Lophoglossus vernix	Added to VA list		Will 1999
Loxandrus celer	Added to VA list	Cited VMNH specimen from Virginia Beach	Bousquet 2012b
Loxandrus crenatus	Added to VA list		Bousquet 2012b
Loxandrus duryi	Added to VA list		Bousquet 2012b
Oodes americanus	Added to VA list		Bousquet 1996
Pasimachus punctulatus	Added to VA list	Carrington (2002) thesis cited as source of VA record	Bousquet 2012b; this paper
Platynus opaculus	Added to VA list	Not recorded for VA in Bousquet 2012b list	Evans 2008
Tachys oblitus	Added to VA list		Hoffman 2010; this paper
Tachys rhodeanus	Added to VA list		Bousquet 2012b
Scaphinotus ridingsii ssp.	Addition/deletion	*S. ridingsii monongahelae* added to VA list and *S. r. intermedia* synonymized with *S. r. ridingsii*	Bousquet 2012b
Cicindela limbalis	Deleted from VA list due to taxonomic uncertainty	Genetic study of a Virginia population by Woodcock & Knisley (2010) concluded that *C. limbalis*, *C. splendida*, and *C. denverensis* may represent one species.	Bousquet 2012b
Cicindela puritana	Deleted from VA list	No known Virginia records; listed as *Ellipsoptera puritana* in Bousquet (2012b)	This paper
Elaphropus levipes	Deleted from VA list	Synonym of *E. xanthopus*	Bousquet 2012b
Loxandrus inferus	Deleted from VA list	Synonym of *L. velocipes*	Will & Liebherr 1997
Scaphinotus hubbardi	Deleted from VA list	Listed erroneously for VA by B&L93	Bousquet 2012b
Bembidion stephensii	Needs confirmation	VA record in B&L93 needs confirmation; exotic	Bousquet 2012b
Diplocheila striatopunctata	Needs confirmation	VA record in B&L93 needs confirmation	Bousquet 2012b
Selenophorus palliatus	Needs confirmation	VA record in B&L93 needs confirmation	Bousquet 2012b
Tetragonoderus intersectus	Needs confirmation	VA record in B&L93 needs confirmation	Bousquet 2012b
Badister micans	Name change	Replaces *B. ocularis* on list	Bousquet 2012b
Dyschirius sublaevis	Name change	Replaces *D. filiformis* on list	Bousquet 2012b
Loxandrus vulneratus	Name change	Replaces *L. vitiosus* on list	Bousquet 2006a
Pterostichus praetermissus	Name change	Replaces *P. commutabilis* on list	Bousquet & Webster 2004
Stenocrepis mexicana	Name change	Replaces *S. quatuordecimstriata* on list	Bousquet 1996

The distribution of this small beetle (3.5-4 mm) appears to be northern (Bousquet & Larochelle, 1993: Quebec to Alberta, south in the interior to Texas and on the Atlantic Coast to New Jersey). Bousquet (2012b) noted that "coast of Virginia and Florida" was cited in the range statement of the original description (Say, 1823). Despite extensive sampling in coastal Virginia habitats in recent decades, only one confirmed specimen of *D. pallipennis* has been collected.

BEMBIDIINI

Bousquet & Larochelle (1993) listed only two species of the diminutive genus *Paratachys* (treated as a subgenus of *Tachys* by Bousquet, 2012b) for Virginia. Hoffman et al. (2006) reported five others and Hoffman (2010) added *T. oblitus* Casey, though he failed to note it was the first Virginia report. Bousquet (2012b) listed *T. rhodeanus* Casey for Virginia but without details. We lack records for the latter species, but provide additional records for *T. oblitus*.

Tachys oblitus Casey

VMNH has 16 specimens (6 det. R. L. Davidson) from 10 localities in eight eastern Virginia counties: Accomack (Assateague Island), Dinwiddie (Ft. Pickett), Greensville (two sites near Skippers), Henry (Ridgeway), Isle of Wight (Antioch Pines Natural Area Preserve), Northampton (Savage Neck Dunes Natural Area Preserve), Prince William (Bull Run Mountains Natural Area Preserve; Quantico Marine Corps Base), and Sussex (4 mi SE of Sussex). Capture dates range from 21 May to 15 September.

Most of the reported jurisdictions for this species are in the northeastern United States and adjacent Canada, but its overall range extends from Quebec south to North Carolina and Alabama, thence west to Iowa and Texas (Bousquet, 2012b).

LICININI

Badister flavipes flavipes LeConte
NEW STATE RECORD

Clarke Co.: 4.1 mi W of Paris, Shenandoah River at Hwy. 50 [= U.S. Rt. 17/50], ca. 400′, 2 July 1970 (2), 3-4 July 1970 (1), all T. L. Erwin and L. J. Erwin (USNM). *City of Fairfax*: Fairfax, 1928 (2) and 1933 (1), all A. Nicolay (USNM; months/days illegible). *City of Richmond*: James River Park at "The Wetlands", 8 April 2011, S. M. Roble, VDNH (1).

Ball (1959) recognized two subspecies north of Mexico (and a third in Mexico), largely on the basis of color differences, but Bousquet (2012b) synonymized *B. f. laticeps* Blatchley with the nominate form. This subspecies ranges from New York to Nebraska, south to Florida and Texas, and has also been recorded from the Bahamas (Bousquet, 2012b). It was previously recorded from Maryland and the District of Columbia, so its presence in Virginia was expected. At 6 mm, black, and iridescent, this beetle superficially resembles a species of *Bembidion* at first glance.

Badister grandiceps Casey
NEW STATE RECORD

VMNH has 23 specimens from six localities in eastern Virginia: *Accomack Co.*: Assateague Island, Chincoteague National Wildlife Refuge, pond west of Ragged Point Trail, 11 August 1998, uv, S. M. Roble, VDNH (1). *Isle of Wight Co.*: Blackwater Ecological Preserve, 7 km S of Zuni, pine barrens, 1 July 1994, uv, S. M. Roble, VDNH (2); Antioch Pines Natural Area Preserve, 5 km S of Zuni, 21 May 1996, uv, S. M. Roble & R. L. Hoffman (14). *King and Queen/Middlesex Co.* line: Dragon Run Swamp, Big Island, 1.5 mi SE of Va. Rt. 602, 8 June 1999, uv, C. S. Hobson & A. Belden, VDNH (4). *Prince William Co.*: Quantico Marine Corps Base, Camp Upshur, 7 June 1999, uv, A. C. Chazal, VDNH (1) [record omitted from Hoffman, 2010]. *Sussex Co.*: Chub Sandhill Natural Area Preserve, 11 May 2000, uv, C. S. Hobson, VDNH (1).

The distribution of this species is primarily northern (Nova Scotia and Prince Edward Island to British Columbia, south in the interior to Kentucky and Nebraska and on the Atlantic Coast to Washington, DC; Bousquet, 2012b). Considering that the type locality is the District of Columbia (Casey, 1920), it is surprising that this species was not recorded from Virginia previously. The records cited above represent a slight southward extension of the known range.

HARPALINI

Agonoleptus rotundicollis (Haldeman)

Cumberland Co.: 2 km SW of Columbia, clearcut north (DF), 1 May 1990 (4), 17 May 1990 (2), 1 July 1990 (1), 16 July 1990 (1); hardwoods north (DF), 1 May 1990 (1); 7 km SW of Columbia, hardwoods south (DF), 15 August 1990 (1); all J. C. Mitchell. *Rockingham Co.*: 2.5 mi WNW of Brown Mountain Overlook, 2565′, pine-oak-heath talus slope, Shenandoah National Park, 28-29 June 2005, uv, A. C. Chazal and S. M. Roble, VDNH (Shenandoah National Park collection, 1; det. A. V. Evans).

This small, primarily northern species (formerly known as *Stenolophus rotundicollis*) was added to the Virginia fauna by Bousquet (2012b) without details. He reported the range as extending from Quebec to Minnesota and south to the Carolinas and Mississippi.

PLATYNINI

Agonum rufipes Dejean

Cumberland Co.: 2 km SW of Columbia, clearcut north (DF), 2 March 1990 (1); 5.5 km SW of Columbia, clearcut south (DF), 2 March 1990 (1), 2 April 1990 (1); all J. C. Mitchell. *Pulaski Co.*: Radford Army Ammunition Plant, Dublin facility, Train Pond, DF 5, 6 May 1998, S. Garriock (1). *City of Virginia Beach*: Dam Neck Navy Base, dune DF site, 12 October 1990, K. A. Buhlmann, VDNH (1).

Bousquet & Larochelle (1993) recorded this species from many eastern states (also Arizona and California) and the District of Columbia, but not Virginia. Bousquet (2012b) added *A. rufipes* to the state list without details. The few VMNH records indicate that it is not often collected in Virginia.

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Six Click Beetles New to the Virginia Fauna (Coleoptera: Elateridae)

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ABSTRACT

Six click beetles, *Agriotes collaris* (LeConte), *Melanotus castanipes* (Paykull), *M. leonardi* (LeConte), *Denticollis denticornis* (Kirby), *Athous productus* (Randall), and *Paradonus jerseiensis* Stibick, are reported from Virginia for the first time. The last is a minute, poorly known, and potentially rare species that is currently documented by less than a dozen specimens rangewide.

Key words: beetle, Elateridae, Coleoptera, Virginia.

The Family Elateridae, commonly known as click beetles because of their ability to produce an audible "snap" and propel themselves upward (i.e., jump), contains almost 1,000 described species in North America north of Mexico (Johnson, 2002). The most recent taxonomic revision of this entire fauna is LeConte (1853), but regional treatments exist for some areas in the East (e.g., Dietrich, 1945 for New York; Downie & Arnett, 1996 for the Northeast). Documentation of the Virginia elaterid fauna is still in its infancy, but it likely exceeds 150 species. By comparison, Ulke (1902) recorded 131 species for the District of Columbia and vicinity, Brimley (1938) listed 125 species for North Carolina (current total is 160 species; P. J. Johnson, unpub. data), and Majka et al. (2011) provided documentation for 160 species from Maine. Downie & Arnett (1996) listed only 63 species for Virginia as well as seven others from the District of Columbia that purportedly had not yet been recorded from the state. However, Stibick (1990) had reported three of those seven species from Virginia and also described two widespread, minute elaterids (*Negastrius arnetti* and *Paradonus olivereae*) that inhabit the state. Neither of these species was included in the compilation by Downie & Arnett (1996).

Recent additions to Virginia's elaterid fauna include *Aeolus scutellatus* (Schaeffer) and *Neopristilophus aethiops* (Herbst), both collected during the Potomac Gorge Bioblitz (Evans, 2008), and *Conoderus scissus* (Schaeffer), a southern species that had not been recorded previously north of South Carolina (Hoffman, 2007). Dozens of additional species have been recorded from states both to the north and south of Virginia, but they have not yet been reported in the literature as occurring in the state, although many, especially those that are common and widespread, undoubtedly inhabit the Commonwealth. Much remains to be learned about the composition, distribution, and status of the click beetle fauna of Virginia.

During the past quarter century, large numbers of elaterids have been amassed at the Virginia Museum of Natural History (all specimens cited below are deposited there unless otherwise noted) primarily through the statewide sampling efforts of personnel of our respective agencies (VDNH and VMNH hereafter). In recent years, RLH had begun the laborious process

*Deceased

of sorting and attempting to identify this material, but many specimens proved to be difficult to readily assign to species using existing keys. Although these curatorial efforts are far from complete, we take this opportunity to report on the occurrence of six selected species, including one that is poorly known and potentially rare, which have not been previously recorded from Virginia.

Elaterinae

Agriotes collaris (LeConte)
NEW STATE RECORD

The last revision of the North American representatives of this widespread genus (found on all continents except Australia and Antarctica) was prepared by Becker (1956), who reported that most Nearctic species inhabit the northern and/or western portions of the continent. He recorded only four of the 32 native Nearctic species from Virginia: *A. insanus* Candèze, *A. isabellinus* (Melsheimer), *A. oblongicollis* (Melsheimer), and *A. pubescens* Melsheimer, the latter based only on several old specimens labeled "Va." Three boreal congeners, *A. collaris* (LeConte), *A. limosus* (LeConte), and *A. mancus* (Say), were reported to occur south as far as Pennsylvania, New York (Adirondacks), and Maryland (state record only), respectively, and they may thus be considered as "potential species" for Virginia.

Pitfall trapping conducted in conjunction with an ecological study (Buhlmann et al., 1988) of the Cow Knob Salamander (*Plethodon punctatus* Highton) has confirmed the occurrence of *A. collaris* in the mountains of northwestern Virginia (Fig. 1): *Rockingham Co.*, Shenandoah Mountain, jct. Co. Rt. 924 and Forest Service 85 [= Briery Branch Gap], 23 May 1987, K. A. Buhlmann (2); Tomahawk Mountain, ca. 7 mi NNW Rawley Springs, DF in virgin stand off Forest Service 72, 28 May 1988 (4), 17 June 1988 (2), all K. A. Buhlmann. Both collection sites are within the Shenandoah Mountain Crest Special Biological Area of the George Washington National Forest, which was established in 1994 to protect habitat of the Cow Knob Salamander. Elevations of these sites are 3600 and 3700 feet, respectively (1097 and 1127 m).

Becker's (1956) distribution map for *A. collaris* showed the range extending from New Brunswick to southwestern Pennsylvania. Bousquet (1991) recorded it from five provinces in Canada (Ontario, Quebec, New Brunswick, Nova Scotia, and Prince Edward Island) and Downie & Arnett (1996) listed it for four of these provinces and all New England states except for Rhode Island, as well as New York and Pennsylvania. Majka et al. (2011) listed it for all of the New England states. The Virginia sites are apparently the southernmost known, representing a range extension of some 250 miles/400 km from Jeanette (Westmoreland Co.), Pennsylvania.

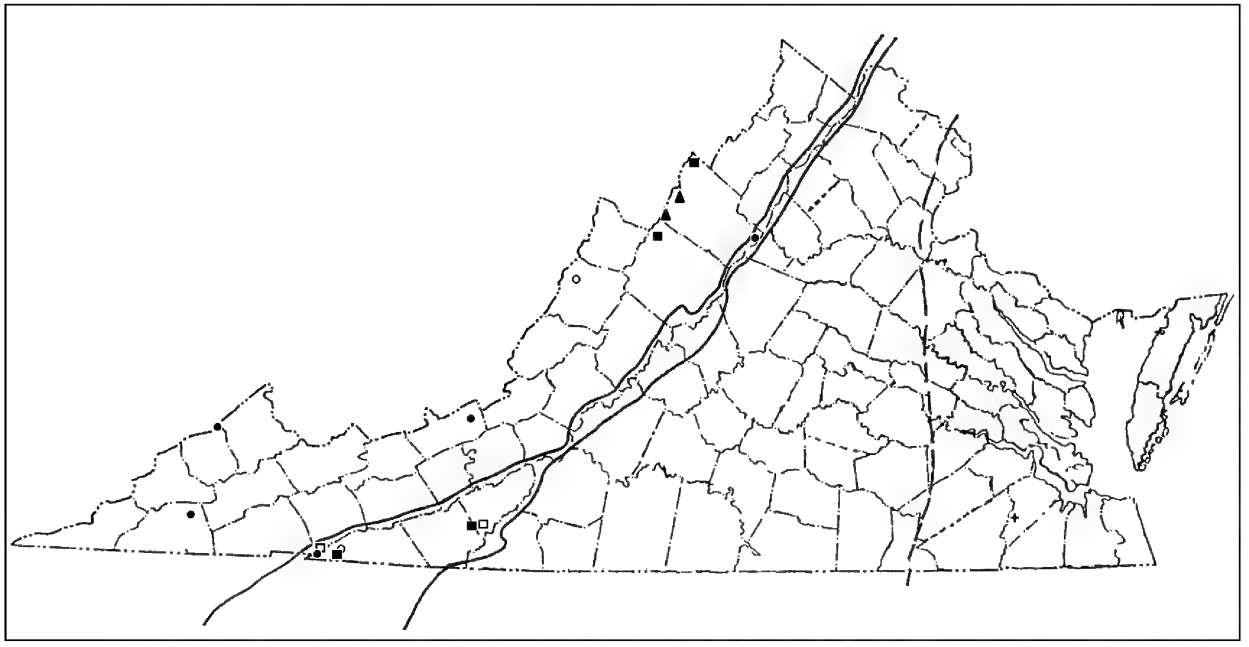

Fig. 1. Known distribution in Virginia of *Agriotes collaris* (▲), *Athous productus* (o), *Denticollis denticornis* (●), *Melanotus castanipes* (■), *M. leonardi* (□), and *Paradonus jerseiensis* (+). Solid lines indicate the limits of the Blue Ridge physiographic province and the dashed line marks the location of the Fall Line separating the Coastal Plain and Piedmont regions.

Melanotus castanipes (Paykull, 1800)
NEW STATE RECORD

This relatively large (15-20 mm), reddish brown Holarctic species is widely distributed in eastern Canada (ranges west to Manitoba), the United States, and Mexico (Quate & Thompson, 1967; Bousquet, 1991; Hallan, 2011). Downie & Arnett (1996) recorded *M. castanipes* from 17 states (PA and NC being nearest to VA) and three eastern provinces (it occurs in a total of seven provinces *fide* Bousquet, 1991), whereas Hallan's (2011) on-line list includes 23 states (Maine to Utah, south to Georgia and California), with only North Carolina and Georgia being south of Virginia. Fattig's (1951) records for Georgia require confirmation (P. J. Johnson, pers. comm.). Ulke (1902) reported this species from the District of Columbia vicinity, but there are no confirmed records for adjoining areas of northern Virginia. Quate & Thompson (1967) recorded *M. castanipes* from Wake County, North Carolina (Raleigh area), which is quite distant from the documented Virginia localities (confined to the Blue Ridge and Ridge and Valley physiographic provinces; Fig. 1), perhaps suggesting a mislabeled or adventive specimen.

Augusta Co.: Little Bald Mountain [= Little Bald Knob], 7 mi WNW of Stokesville, 1989 [no month or day specified on label], C. A. Pague, VDNH survey (1). *Carroll Co.*: Co. Rt. 629, ca. 0.5 km S Carroll-Floyd county line, 12 June 2007, uv, A. C. Chazal and S. M. Roble, VDNH survey (3). *Floyd Co.*: Buffalo Branch at Co. Rt. 727, 24 May 2007, uv, S. M. Roble and M. E. Dougherty, VDNH survey (2); same but 12 June 2007, uv, A. C. Chazal and S. M. Roble, VDNH survey (1). *Grayson Co.*: Grayson Highlands State Park, *Picea rubens* stand ca. 100 m NE of Massie Gap parking area, 1 June 2011, uv (3); same but Cox Visitor Center, Haw Orchard Mountain, 2 June 2011, uv (2); same but Cox Visitor Center bus parking lot picnic area, yellow birch-red spruce woods, Haw Orchard Mountain, 2 June 2011, uv (4); same but Massie Gap roadside parking area, 2 June 2011, uv (1); all S. M. Roble, VDNH survey. *Rockingham Co.*: Smith Mountain, FR 177, 1.2 km off Co. Rt. 823, 5 mi NW Bergton, N 38.8° W 79.0°, 29 April 2009, uv, S. M. Roble and A. C. Chazal, VDNH survey (1).

Melanotus leonardi (LeConte, 1853)
NEW STATE RECORD

Quate & Thompson (1967) cited the range of this smaller (9-11 mm) but very distinctive (bright red pronotum and black elytra) congener as "Quebec to North Carolina, west to Texas" and provided records for nine, mostly northern states and two provinces in eastern Canada. However, Fattig (1951) had previously listed five Georgia localities for *M. leonardi*, with the southernmost one being Fort Valley (Peach Co.). Quate & Thompson (1967) cited a record from Buncombe County, North Carolina without further data, which was likely from the Black Mountains. Bousquet (1991) was aware of records for only three Canadian provinces (Ontario, Quebec, and Manitoba). The vast majority of the range of *M. leonardi* is well to the north of Virginia, suggesting that this species may be limited to the higher mountains of the state (Fig. 1).

Floyd Co.: Buffalo Mountain [Buffalo Mountain Natural Area Preserve], 22 June 2005, C. L. Staines and S. L. Staines (2); *Grayson Co.*: Elk Garden, Co. Rt. 600, [Mount Rogers National Recreation Area], 14 July 1995, R. L. Hoffman, VMNH survey (1). Both of these sites exceed 3900 feet (1200 meters) in elevation.

Prosterninae

Denticollis denticornis (Kirby, 1837)
NEW STATE RECORD

Becker (1952) reviewed the four Nearctic species placed in the genus *Denticollis* at that time, but he later (Becker, 1974) synonymized his new species *D. quadrosa* Becker with *Athous appalachius* Van Dyke and also transferred *D. productus* (Randall) to *Athous*. *Denticollis denticornis* (9-13 mm), the lone remaining eastern representative of the genus, ranges from Nova Scotia to Alberta, south to Illinois, Ohio, Pennsylvania, North Carolina, and Tennessee (Becker, 1952). Bousquet (1991) listed this species from 10 Canadian provinces (Newfoundland to British Columbia) and Majka & Johnson (2008) recently added Prince Edward Island to the known distribution. Majka et al. (2011) listed it from Connecticut, perhaps for the first time. Curiously, Downie & Arnett (1996) included only four states and two provinces in their range statement, noting that this species is "Frequently beaten from roadside herbage in NY" and resembles a firefly (Lampyridae) more than it does a typical click beetle (RLH believes it looks very much like a cantharid at first glance). Adults have yellow margins on the prothorax. Thomas (1941) found it "on weeds in wet ground" in Pennsylvania.

The North Carolina and Tennessee records of *D. denticornis* are from the higher mountains (e.g., Mt. Mitchell, Black Mountains, Great Smoky Mountains National Park) in the southern Appalachians (Becker, 1952; Discover Life in America, 2012; USNM collection). The Virginia records (Fig. 1) partially fill the hiatus between these records and those in Pennsylvania (Thomas, 1941; Becker, 1952).

Dickenson Co.: Breaks Interstate Park, 1-6 June 2008, A. V. Evans, VDNH survey (1). *Giles Co.*: Mountain Lake, no dates, H. Ulke (USNM, 2; specimens identified in 1948 and 1954, respectively). *Grayson Co.*: White Top Mountain, DF site off FS 89, 5000′, Mount Rogers National Recreation Area, 23 June 1994, R. L. Hoffman, VMNH survey (1). *Scott Co.*: Co. Rt. 653, 0.2 km W jct. Co. Rt. 902 (= Sulphur Spring), 5 mi W Dungannon, 25 May 2004, uv, A. C. Chazal, VDNH survey (2); same but Co. Rt. 653, 1.3 km W jct. Co. Rt. 902 (3); Co. Rt. 653, 3 mi W jct. VA Rt. 72, W of Dungannon, 25 May 2004, uv, A. C. Chazal, VDNH survey (4). *Rockingham Co.*, Shenandoah National Park, Dean Mountain Ridge, 8 June 2005, A. C. Chazal and C. S. Hobson, VDNH survey (Shenandoah National Park collection, 1).

Athous productus (Randall, 1838)
NEW STATE RECORD

Becker (1974) provided a detailed description of *A. productus* (12-15 mm) and justified the character states he considered when transferring it from *Denticollis*. He saw specimens only from localities well to the north of Virginia: Quebec to Saskatchewan, and south to Maine, New York, and Minnesota. Downie & Arnett (1996) noted that the species is "uncommon" and listed the same states (Maine, Michigan, Minnesota, New Hampshire, New York, Vermont, Wisconsin) and provinces (Ontario, Quebec, Manitoba, Saskatchewan) as Becker (1974). Earlier reports (as *Lepturoides productus*) from North Carolina (Mt. Mitchell and Craggy Mountains; May/June, spruce habitats; Brimley, 1938) and Pennsylvania (Horse Valley, Latrobe, and Jeannette; Thomas, 1941) were apparently overlooked by Becker (1974) and Downie & Arnett (1996). Dietrich (1945) knew of only a few records from New York (Cranberry Lake, Catskills, Oliverea); he also examined a specimen from Mt. Washington, Vermont. This boreal species has been documented from four additional Canadian provinces in recent decades (Alberta: Fuller, 1992; Newfoundland: Bousquet, 1991; New Brunswick and Nova Scotia: Majka et al., 2011). Additional sampling in the higher mountains of Virginia may yield more specimens.

Bath Co.: Warm Springs Mountain, crest road 1 km S of Virginia Route 39, [3100′], rich woods, 2 June 1999, uv, J. C. Ludwig, VDNH survey (1). *Grayson Co.*: Grayson Highlands State Park, Massie Gap [trailhead parking area, 4680′], 1 June 2011, uv, S. M. Roble, VDNH survey (1); same but parking lot by picnic area, [Cox Visitor Center], Haw Orchard Mountain, [4815′], yellow birch-red spruce woods, 2 June 2011, uv, S. M. Roble (2).

Negastriinae

Paradonus jerseiensis Stibick, 1990
NEW STATE RECORD

Stibick (1990) described this minute (2.5-3 mm), blackish brown species on the basis of five specimens from Angelsea and Sattelhurst, New Jersey. We are not aware of any subsequent reports. Thus, the Virginia record, from a remnant longleaf pine (*Pinus palustris* Miller) barren habitat, represents a southwestward range extension of at least 375 miles/600 km.

Isle of Wight Co.: Blackwater Ecological Preserve, 7 km S of Zuni, 12 May 1999, uv, S. M. Roble, VDNH survey (1).

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Three Wolf Spiders New to the Virginia Fauna (Araneae: Lycosidae)

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ABSTRACT

Three wolf spiders, *Schizocosa crassipes* (Walckenaer), *S. salsa* Barnes, and *Pardosa distincta* (Blackwall), are reported from Virginia for the first time. The last is a boreal species at its southernmost known locality in the eastern United States, whereas *S. salsa* was previously recorded only at the type locality in North Carolina. Additional Virginia records are provided for *S. humilis* (Banks), including a site in far southwestern Virginia outside of the previously known range of the species.

Key words: spider, Lycosidae, Araneae, Virginia.

In the virtual absence of any published listing of regional spider faunas in Virginia, current knowledge of this group depends largely on what records can be abstracted from published taxonomic treatments of various genera or families. Even these are often inadequate, in that they present distributional data in the form of spot maps without detailed citation of the original collection data. It is all too frequent that on such maps Virginia will be devoid of any symbols, or, if any are present, unidentifiable in terms of the county or locality they represent.

Information compiled by the first author in the late 1980s suggested that approximately 600 species of spiders were in one way or another documented from Virginia, with another 200 likely residents of the Commonwealth on the basis of their known distributions. Since that time, inventory surveys conducted by staff of the Virginia Division of Natural Heritage (VDNH) and the Virginia Museum of Natural History (VMNH) have accumulated enormous series of specimens from every part of the state, among which are a predictable number of species in the "probable" category, and even some so far out of range that their occurrence here would never have been anticipated.

"Wolf spiders" of the genera *Pardosa* and *Schizocosa* are widespread and abundant in the eastern United States, some species often achieving high population densities and having substantial importance as small predators in soil-litter biotopes. Various papers (e.g., Vogel, 1964; Lowrie & Dondale, 1981; Dondale & Redner, 1984) have treated the numerous species groups containing the Nearctic representatives of the large (ca. 520 species worldwide; Platnick, 2012) and widespread genus *Pardosa*, which includes 65 species in the continental United States (Vogel, 2004). *Schizocosa* is a much smaller genus, containing about 60 species worldwide, including 27 in North America north of Mexico (Dondale, 2005; Platnick, 2012). Range maps in the most recent treatment of the Nearctic fauna (Dondale & Redner, 1978) showed Virginia localities for seven species (*S. avida* [Walckenaer], *S. bilineata* [Emerton], *S. duplex* Chamberlin, *S. humilis* [Banks], *S. ocreata* [Hentz],

*Deceased

S. retrorsa [Banks], and *S. saltatrix* [Hentz]) as well as for three others - in nearby states - likely to occur here. It is now possible to record Virginia localities for two of the three "potential species" on the basis of recent collections made by inventory programs of VMNH and VDNH. It remains only to discover an in-state population of the third species, *S. communis* (Emerton), which is known to occur from Nova Scotia west to Ontario and south to Pennsylvania (Dondale & Redner, 1978). Of the three newest members of this genus (i.e., those described after 1978) in North America, *S. stridulans* Stratton, which occurs from the Mississippi River east to southern Ohio and eastern Tennessee (Stratton, 1991), should be regarded as a potential species in Virginia and sought in the far southwestern portion of the state. Also, *S. uetzi* Stratton, which ranges from Arkansas and Louisiana east to northeastern Alabama and central Tennessee (Stratton, 1997), may occur in the westernmost counties of Virginia.

This paper documents the occurrence in southeastern Virginia of two species of *Schizocosa* of dominantly more austral distribution, as well as a species of *Pardosa* in the mountains of western Virginia that has a primarily boreal distribution. Although these records (all VMNH) represent the northernmost or southernmost known stations for each species, the actual range extensions are not great, and as poorly-known as our spider fauna remains, certainly not surprising.

Schizocosa crassipes (Walckenaer)
NEW STATE RECORD

For many years, the name *S. crassipes* was unknowingly applied to two very similar species, adequately distinguished only in the revision of *Schizocosa* by Dondale & Redner (1978). As there defined, *S. crassipes* is a small species confined largely to the Atlantic and Gulf Coastal Plains: South Carolina to southern Florida and west to Alabama, with an isolated record from coastal North Carolina (vicinity of Morehead City). Virginia specimens are available from the following localities: *Greensville Co.*: Fontaine Swamp at Co. Rt. 625, low wet grassy area, 25 May 1989, R. L. Hoffman (1). End of Co. Rt. 666, 1 mi NE of Claresville, 21 June - 14 July 1993, VMNH survey [R. L. Hoffman] (10); same but 25 March-26 May 1994 (27). *Isle of Wight Co.*: Antioch Pines Natural Area Preserve, 4 mi S of Zuni, unburned area DF, 6 June 2002, P. Koury, VDNH survey (1). *Northampton Co.*: Savage Neck Dunes Natural Area Preserve, DF near interdunal ponds, 20 May-22 June 1999, A. C. Chazal, VDNH survey (2). *York Co.*: Cheatham Annex Naval Supply Base, Cheatham Pond DF site, 6 July 1989, VDNH survey [K. A. Buhlmann] (45). Ponds at Grafton, 11 June 1990, C. A. Pague, VDNH survey (17).

The Savage Neck site is near the southern tip of the Delmarva Peninsula (Fig. 1) and represents a northward range extension of at least 190 mi/300 km from the only documented locality in North Carolina (Dondale & Redner, 1978).

Schizocosa salsa Barnes
NEW STATE RECORD

Virginia Beach City: Dam Neck Navy Base, pitfall in swale, 1 August 1990, K. A. Buhlmann, VDNH survey (1♂).

Described from Beaufort, Carteret County, North Carolina (Barnes, 1953), this small and very distinctive species has not to our knowledge been reported since its treatment by Dondale & Redner (1978). Its capture in Virginia is only a slight northward range extension of some 150 miles/250 km, but carries the implication that *S. salsa* may occur farther both to the north and south in appropriate dune habitats.

The limited number of specimens, *vis-á-vis* of *S. salsa*, suggests either actual rarity or occupation of a biotope not adequately sampled by pitfalls. Barnes & Barnes (1954) found this species in coastal North Carolina in the drift (wrack) line of *Spartina alterniflora/S. patens* marshes and estuarine beaches (narrow, sandy, and protected from wave action), but not along wide, sandy oceanfront beaches that are regularly exposed to wave action.

Restriction of the "hair brush" to the distal third of the tibia in males is a definitive recognition character for *S. salsa*, in addition to its small size, color pattern, and unusually long palpal tibia.

Schizocosa humilis (Banks)

This species ranges from Ontario south to Florida and west to Arkansas, with nearly all known records near the Atlantic and Gulf coasts (Dondale & Redner, 1978). Only one record was plotted by these authors for Virginia, presumably in either Norfolk (City) or Cape Henry (Virginia Beach City). The following new collection partially fills the hiatus between this record and the next mapped record to the north (vicinity of Philadelphia): *Accomack Co.*: Assateague Island, Chincoteague National Wildlife Refuge, Grassy Pond DF site, 1 September-1 October 1998, VDNH survey [A. C. Chazal and S. M. Roble], (1♂). Quite unexpectedly, *S. humilis* has also been taken in far southwestern Virginia beyond the known range of this species (see map in Dondale & Redner, 1978): *Wise Co.*: Powell Mountain Karst Preserve, ca. 1.3 km E of Crackers Neck Church, pitfall traps near Solomon's Seal Cave, 28 April-10 May 2009, C. S.

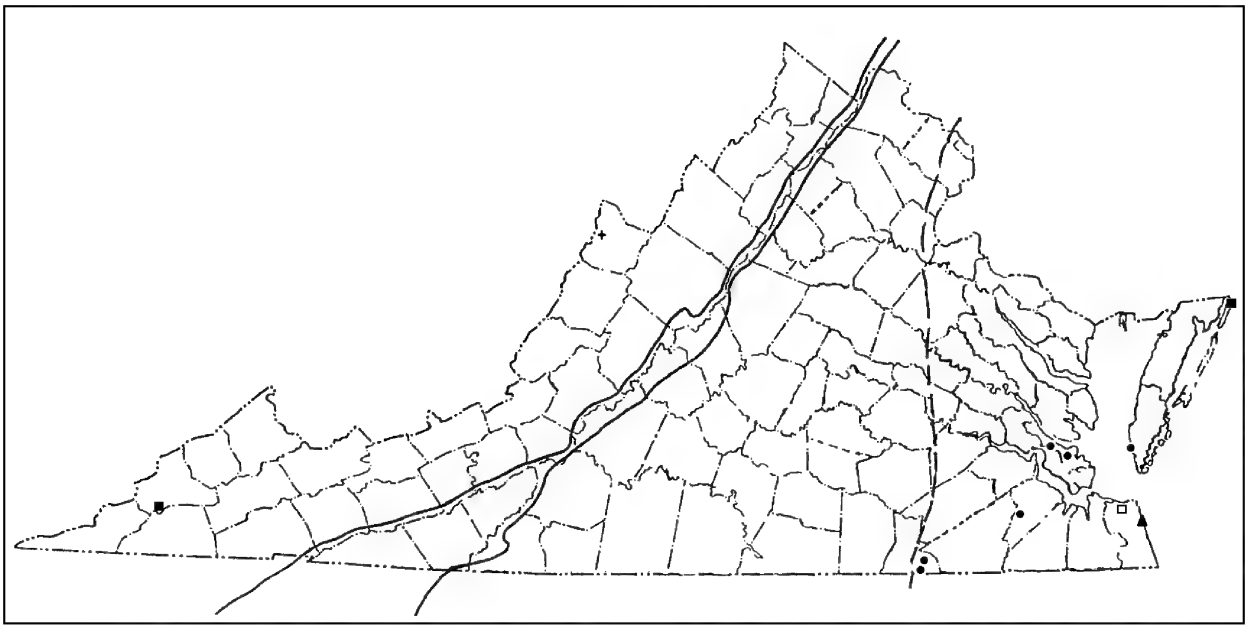

Fig. 1. Known distribution in Virginia of *Pardosa distincta* (+), *Schizocosa crassipes* (●), *S. salsa* (▲), and *S. humilis* (■). The open square (□) shows the approximate location of a literature record (Dondale & Redner, 1978) for *S. humilis*. Solid lines indicate the limits of the Blue Ridge physiographic province and the dashed line marks the location of the Fall Line separating the Coastal Plain and Piedmont regions.

Hobson and A. C. Chazal, VDNH survey (6♂). As more material is obtained from this part of the state, the possibility that this population could represent an undescribed sister species to *S. humilis* should be investigated.

Pardosa distincta (Blackwall)
NEW STATE RECORD

Highland Co.: Back Creek, 2.2 mi S jct. US Hwy. 250 on Co. Rt. 600, baited pitfall, 8 June 2011, S. M. Roble, VDNH survey (1♂).

This species is widespread in the northern United States and southern Canada, occurring throughout the Rocky Mountains from Arizona and New Mexico north into Alberta and extending eastward into the New England states south to Connecticut (Vogel, 1964, 2004; Dondale & Redner, 1990). It is also known from Pennsylvania (Vogel, 2004), with records for at least Westmoreland Co. (Powdermill Nature Reserve; Vogel, 1966) and Potter Co. (VMNH, two 1962 collections by W. A. Shear). Muma (1945) listed *P. distincta* from Garrett County in western Maryland (six females were "taken under logs in an open field"), apparently the southernmost record in the East prior to the present report. Gertsch & Wallace (1935) stated that this species is abundant in grassy meadows, being "one of the dominant forms of the genus in New England and eastern Canada." They also noted that it is common in suitable habitats at elevations of 5,000-8,000 feet in the Rocky Mountains. *Pardosa distincta* was described as being "extremely common" throughout Connecticut (Kaston, 1981) and Dondale & Redner (1990) reported that it inhabits fields, pastures, meadows, bogs, wheat fields, and orchards, and grassy clearings in woods. Collection sites in Michigan included beaches, shore outcrops, old fields, gravel pits, pine plantations, and deciduous forests (Wolff, 1981). The Virginia collection site is in a grassy meadow along Back Creek at an elevation of 875 meters (2870′).

The palpal organ of *P. distincta* (see Gertsch & Wallace, 1935: 2, fig. 4; Kaston, 1981: 681, fig. 1099; Dondale & Redner, 1990: 150, fig. 182) is perhaps the most distinctive of any Virginia lycosid and cannot be confused with that of any other local species.

ACKNOWLEDGEMENTS

We thank Kurt Buhlmann, Anne Chazal, Chris Hobson, Phil Koury, and Chris Pague, current or former members of the VDNH staff, for their collecting efforts.

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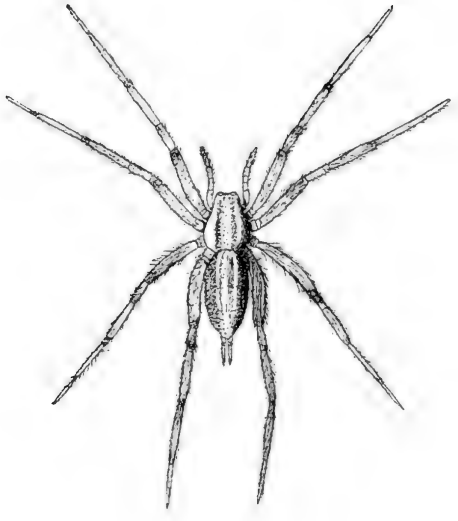

Grass spider, *Agelenopsis* sp. (Araneae: Agelenidae); original drawing by Richard L. Hoffman (previously published as the cover illustration for *Banisteria* 15).

Banisteria, Number 40, pages 58-60

Velvety Shore Bugs in Virginia (Heteroptera: Ochteridae)

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ABSTRACT

Distributional records are provided for *Ochterus americanus* (Uhler) (new state record) and *O. banksi* Barber in Virginia, and several points of difference in structure are discussed as regards utility in distinguishing the two species.

Key words: *Ochterus*, Ochteridae, Heteroptera, Virginia, distribution.

The family Ochteridae is represented in the Virginia fauna by two species of the genus *Ochterus.* These small, active, predatory bugs are typically associated with shoreline habitats of ponds and small streams. When these insects were treated by Marvin Bobb (1974) in his fascicle on aquatic and semiaquatic Heteroptera of Virginia, *O. americanus* had not been documented for our fauna although it was known from many eastern states, and he had seen material of *O. banksi* from only a few localities. In recent years the VMNH has acquired a number of specimens, mostly taken incidentally by static trapping procedures, which justify a brief review of current knowledge of the in-state occurrence of the genus. Our resident species were thoroughly described by Blatchley (1926), and their original descriptions were quoted in the revision of the genus by Schell (1943).

Compared to other "shore bugs" such as gelastocorids and saldids, ochterids are not readily collected by traditional (manual) techniques; the majority of the VMNH specimens were captured in pitfall traps set in wet places. I have found *O. banksi* only twice in many decades of visual search, and Bobb (1974) found that species only at five places near Charlottesville (and *O. americanus* not at all) despite his statewide surveys that were productive for other littoral heteropterans. On the other hand, Blatchley (1926) noted that *O. americanus* was "Frequent along the mucky margins of ponds near Dunedin [Florida] and often taken by sweeping low herbage in such places."

*Deceased. Map prepared by Steve Roble, *Banisteria* editor.

Ochterids are generally very similar in external appearance. A difference in shape of the hemelytral membrane mentioned by Blatchley (1926: 1020), "long and narrow" in *O. banksi*, is not evident in Virginia material. Drawings made on tracing paper and superimposed show the same proportions in both species. Blatchley also noted a relatively broader pronotum in *O. americanus*: 2.5 times as broad as long against only about twice as long in *O. banksi.* In Virginia specimens such a difference is not as pronounced: my measurements yield ratio values of 2.4 for *O. americanus* and 2.2 for *O. banksi*. A difference in pronotal outline can be confirmed, in that the anterior "corner" is slightly angulate in *O. americanus* as opposed to evenly rounded in *O. banksi* (Fig. 1).

The difference in coloration is the most diagnostic feature and allows confident species recognition. The pronotum of *O. americanus* is uniformly piceous or black, marked only by the small, nearly round yellow spot at anterior angle; in *O. banksi* the yellow spot is larger, more elongate, and merges into a pale testaceous or amber marginal band that continues to the posterior angle.

Ochterus americanus (Uhler)
NEW STATE RECORD

Cumberland Co.: "north clearcut" DF site, 2 km SW of Columbia, 2 September (1) and 30 September (1) 1990, both J. C. Mitchell. *City of Richmond*: University of Richmond campus, 8 April (no year), Naomi Lewis (1). *City of Virginia Beach*: First Landing (Seashore) State Park, "mesic" DF site, 18 August 1989, K. A.

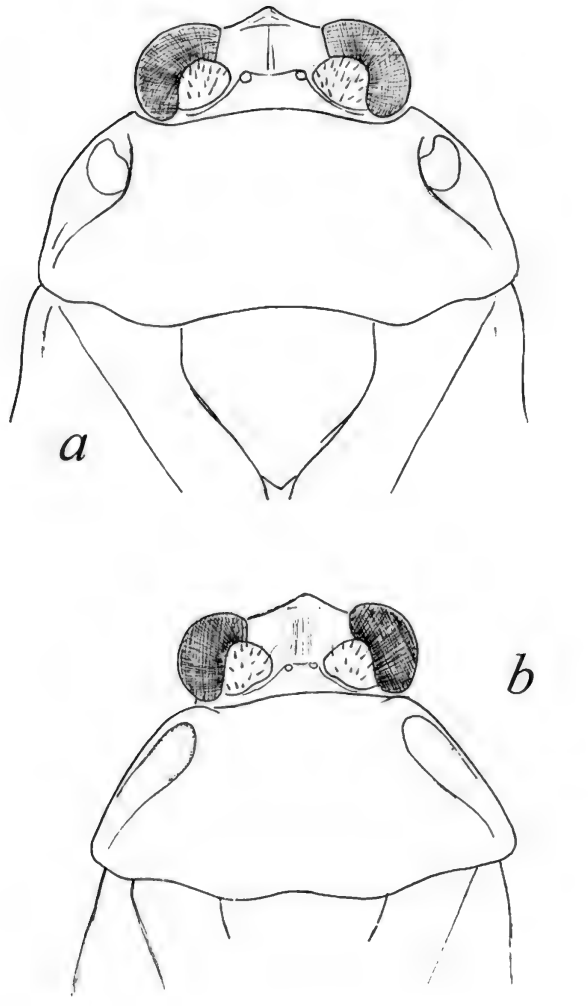

Fig. 1. A. *Ochterus americanus* (Uhler), head and pronotum, dorsal aspect. Yellow color is restricted to the rounded spot in the pronotal explanation. B. *Ochterus banksi* Barber, head and pronotum, dorsal aspect. Yellow color at the anterior third of the outlined area grades into a light testaceous brown extending to posterior angle.

Buhlmann (2); Dam Neck Navy Base, interdunal swale DF site, 12 October (1) and 30 November (1) 1990, both K. A. Buhlmann.

The states of record cited by Polhemus & Polhemus (1988) for *O. americanus* fairly encompass eastern United States except for the extreme southeast. Their citation for "Va." is not supported by reference to either voucher material or a publication. The VMNH specimens listed above represent localities on the Coastal Plain, Fall Line, and central Piedmont. The two species are syntopic at two of these sites and were collected on the same dates in the same pitfalls: Dam Neck Navy Base, 12 October 1989 (1 *O. americanus*, 3 *O. banksi*), and the "north clearcut site" in Cumberland County, 2 September 1990 (1 *O. americanus*, 1 *O. banksi*). Both species also were taken separately at these sites on different dates.

Ochterus banksi Barber

Augusta Co.: Warehouse Marsh Preserve, near Stuarts Draft, 20 June 2002, S. M. Roble (1). *Cumberland Co.*: "north hardwoods" DF site, 2 km SW of Columbia, 16 July 1990 (2); "north clearcut" DF site, 2 km SW of Columbia, 2 September 1990 (1); "south clearcut" site, 5.5 km SW of Columbia, 15 August 1990 (1), all J. C. Mitchell. *Giles Co.*: Dismal Creek, 4 mi NE of Mechanicsburg, 11 June 1977 (1), R. L. Hoffman. *Scott Co.*: Glady Fork wetlands DF site, end of FS 267S, ca. 5 mi NW of Dungannon, High Knob area, 22 July-18 August 1993 (1), C. S. Hobson and S. M. Roble. *City of Virginia Beach*: Dam Neck Navy Base, dune DF site, 7 September 1990 (4); same but interdunal swale DF site, 4 July (1), 1 August (4), 12 October (3), and 30 December (1) 1990, all K. A. Buhlmann.

The distributions of these two bugs (Fig. 2) invite clarification, owing to ambiguity of old records for "*americanus*" and general scarcity of material in collections. In general, *O. banksi* occupies a more southern range: Massachusetts to Florida and Texas, north in the Interior to Indiana, which is consonant with the VMNH records for Virginia Beach and Cumberland County. Our two samples from Giles and Scott counties are, however, embedded in the Ridge and Valley province of western Virginia and are geographically disjunct in that respect. *Ochterus banksi* was described from Arlington County (Glencarlyn), Virginia (Barber, 1913); Fairfax County (Vienna) was added by Schell (1943) and Bobb (1974) had seen specimens from Albemarle (Charlottesville area) and Alleghany (Clifton Forge) counties. These localities, added to the foregoing, suggest a statewide distribution, and a variety of semiaquatic biotopes utilized.

Working with a population at Charlottesville, Bobb (1971) was able to rear specimens of *O. banksi* from egg to adult and provided detailed descriptions and drawings of all the immature stadia.

ACKNOWLEDGEMENTS

For donations of specimens I am grateful to Kurt A. Buhlmann, Christopher A. Pague, Steven M. Roble (all Virginia Natural Heritage Program) and Joseph C. Mitchell.

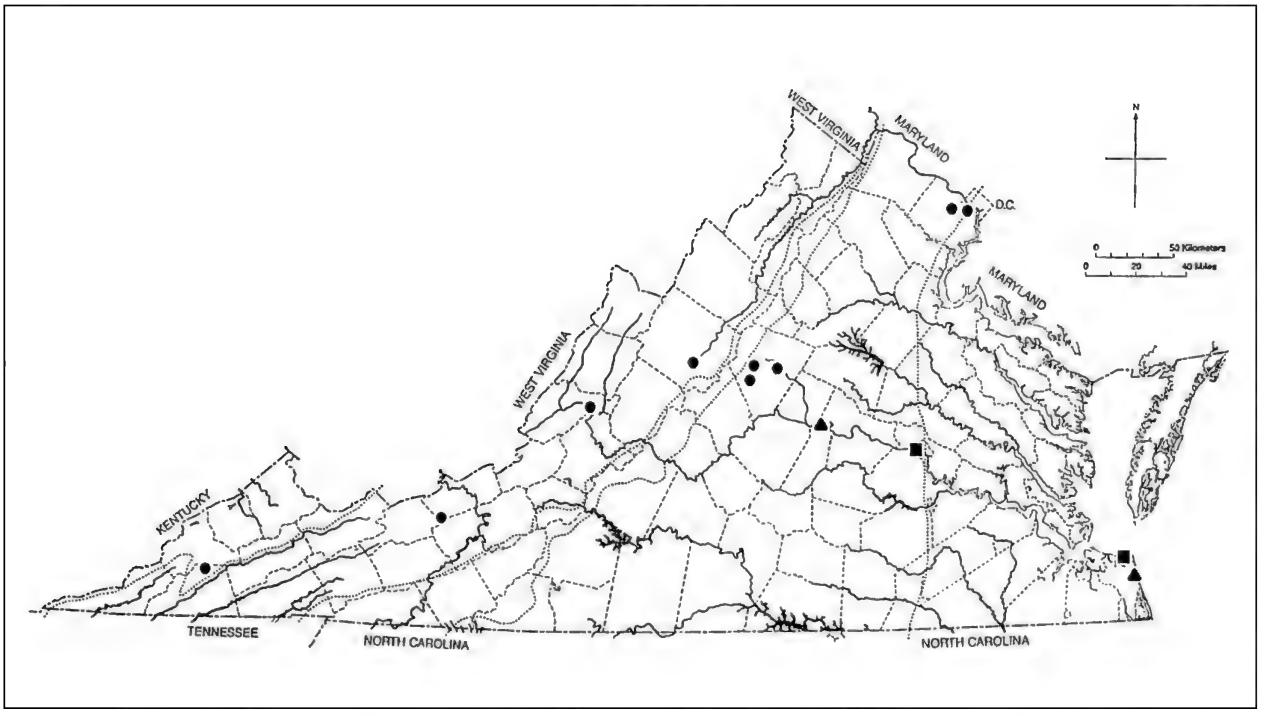

Fig. 2. Known distribution of *Ochterus* americanus (squares) and *O. banksi* (circles) in Virginia. Syntopic sites are indicated by triangles.

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Banisteria, Number 40, pages 61-65

Relative Abundance, Habitat Preference, and Seasonal Occurrence of Two Species of Burying Beetles in Central Virginia (Silphidae)

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ABSTRACT

Two species of burying beetles in the genus *Nicrophorus* are widely distributed in Virginia but have not been studied ecologically. Many more *N. orbicollis* Say were captured in a 13-month drift fence/pitfall trap study in central Virginia than *N. tomentosus* Weber. They differed in their occurrences in hardwood, old field, and pine habitats with *N. orbicollis* preferring hardwoods and *N. tomentosus* having similar affinities for hardwoods and old fields. Except for five *N. tomentosus* in a loblolly pine forest, 48 or more individuals of both species occurred in all three habitats. Peak seasonal activity of *N. orbicollis* was July to August, whereas it was September for *N. tomentosus*. Previous studies inferred that *N. orbicollis* occurs more often in forests than other habitat types with little canopy and labeled *N. tomentosus* a habitat generalist. Our results support the prediction for *N. orbicollis* but *N. tomentosus* has a significant aversion to pine forests in central Virginia.

Key words: ecology, habitat, *Nicrophorus,* carrion beetles, seasonal activity, Virginia.

INTRODUCTION

Studies of vertebrates in contrasting terrestrial habitats reveal that most animals are distributed unequally between and among them. The differences are usually in the proportions of each species present in each habitat type rather than complete segregation (Kirkland, 1990; Mitchell et al., 1997). Invertebrate communities show the same pattern (e.g., Anderson et al., 1995; Burruss et al., 2011) but some, like phytophagous insects, are more habitat-specific than vertebrates. Changes in natural habitats caused by human activities have resulted in dramatic effects, such as complete elimination of canopy cover from logging. Although we cannot study the mosaic of forest and field habitats created by hurricanes, fire, and Native American activities before European invasion, we can infer the natural histories of native species by studying them in the contrasting habitats that currently exist. In the present study, we evaluate the habitat affinities and seasonal occurrences of one group of insects (burying

*Deceased

beetles, Silphidae) in three distinct habitat types (hardwood forests, old fields, planted pine forest). Previous studies suggested that *Nicrophorus orbicollis* (Rounded Burying Beetle) prefers forests over areas without canopy cover and *Nicrophorus tomentosus* (Tomentose Burying Beetle) is a habitat generalist (e.g., Shubeck, 1993; Lingafelter, 1995; Scott, 1998). Our hypothesis is that *N. orbicollis* will be found predominately in forests, whereas *N. tomentosus* will be distributed more evenly among the three habitat types.

MATERIALS AND METHODS

During the period from 7 September 1989 to 30 September 1990, JCM conducted an inventory for terrestrial vertebrates at several localities in the northern part of Cumberland Co., Virginia, in connection with a site evaluation for a proposed coal-fired generating plant. The study sites included two separate mixed, upland hardwood stands (designated as north [HW-N] and south [HW-S], both approximately 40+ yr in age), two areas that had been previously clearcut (old fields, also north [OF-N] and south [OF-S], 3 yr and 6 yr old, respectively), and a single stand of planted loblolly pine (*Pinus taeda*) (approximately 10 years old). Arrays were set at least 185 m away from the nearest edge of the adjacent habitat. The five sites were dispersed roughly along a line extending 3-6 km southwest of the town of Columbia (Fig. 1). Full site descriptions are in Pagels et al. (1992).

The primary sampling technique involved use of pitfall-drift fence arrays in the three habitat types. Each array included three 8-m long strips of aluminum flashing set upright in an exploded Y configuration with the proximal end of each arm placed about 7-8 m away from the center point in the study area. A plastic 5-gallon bucket was buried flush in the ground at each end of each arm; six pitfall traps in each array. Traps contained a preservative composed of 10% formalin and ethylene glycol, and were cleared at two-week intervals.

Burying beetles of the genus *Nicrophorus* often comprise a major component of pitfall captures, especially if any small mammals have been trapped and begun to decompose. In the Cumberland study, over 1,800 specimens of two species, *N. orbicollis* and *N. tomentosus*, fell into the pitfalls and form the basis for the present observations. Both of these species are statewide in Virginia, but *N. orbicollis* is more abundant eastward and is especially numerous in the Coastal Plain (R. L. Hoffman, pers. obs.). Conversely, *N. tomentosus* is by far more frequently taken in the mountains, as reflected by the numbers of captures recorded in the VMNH files.

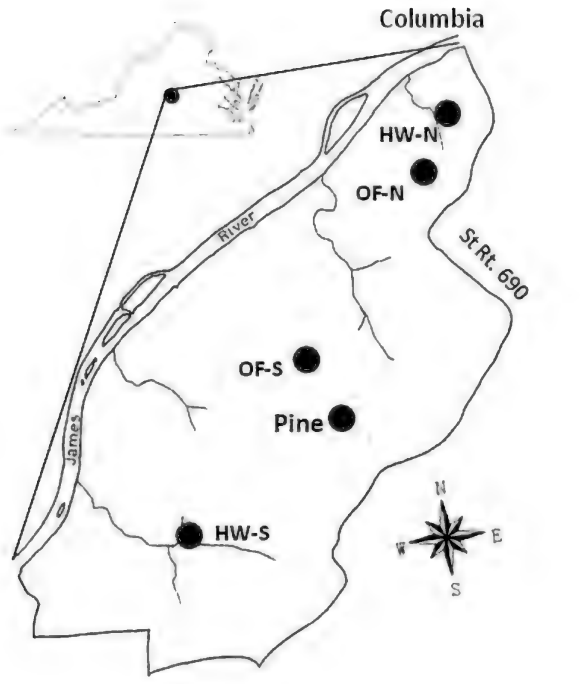

Fig. 1. Location of the five study sites in Cumberland County, Virginia. Abbreviations: HW-N = hardwoods north, HW-S = hardwoods south, OF-N = old field north, OF-S = old field south, Pine = planted pine forest.

RESULTS AND DISCUSSION

Nicrophorus orbicollis

We processed a total of 1,747 specimens of *N. orbicollis* (Table 1). Many of the beetles caught in hardwoods were the result of their attraction to decaying rodents in several buckets in August which skewed the numbers captured in this habitat type. Their preference for hardwoods is obvious (X^2 [Chi square] = 2,122.6, $P < 0.001$; April-September samples only to balance the comparison with effort in the pine site). Old fields are preferred over pine forests ($X^2 = 6.72$, $P < 0.05$; April-September samples only).

Other studies conducted in deciduous forests in eastern North America (e.g., Shubeck, 1993; Lomolino et al., 1995) have shown that, when having the option, *N. orbicollis* prefers forests over open biotopes, reflecting the remarkable preponderance found in Cumberland County hardwoods as noted above. When forests are lacking, as in the Great Plains, the species can function successfully in grassy, treeless areas (Lingafelter, 1995;

Table 1. Relative abundance and seasonal activity patterns of two species of burying beetles (*Nicrophorus*) in Cumberland County, Virginia, in three contrasting habitats. Abbreviations: HW – hardwoods, OF – old field, Pine – pine forest. Trap days: 2346 (HW), 2190 (OF), 1284 (pine). Numbers represent individual captures.

	N. orbicollis			*N. tomentosus*		
Month	HW	OF	Pine	HW	OF	Pine
Sept 89	38	0	-	14	10	-
Oct 89	9	0	-	5	1	-
Nov 89	0	0	-	1	0	-
Apr 90	22	5	4	0	0	0
May 90	89	19	6	0	0	0
June 90	114	1	0	1	1	0
July 90	675	44	53	2	6	0
Aug 90	451	69	29	1	0	0
Sept 90	111	1	7	41	50	5
Total	1509	139	99	65	75	5
No./trap day	0.643	0.063	0.077	0.028	0.034	0.004

Ratcliffe, 1996). Presumably prairie habitats represent stabilized climax conditions, with mammalian faunas that are more established and reliable as food resources than those in the early successional stages of recovering clearcut stands. Forest cover appears to be an important factor in their distribution in central Virginia.

Our samples of *N. orbicollis* were collected between 1 May and 19 October, with an evident peak in July and August. Ratcliffe (1996) reported seasonal data for 8,838 specimens of *N. orbicollis* captured throughout Nebraska with a peak in July and August. Comparisons of Virginia and Nebraska samples by month revealed similar seasonal patterns (Table 2).

Nicrophorus tomentosus

Only 8% as many specimens of *N. tomentosus* (145) was captured at the Cumberland sites compared to the capture total for *N. orbicollis* (1,747). This disparity perhaps indicates the actual relative numerical abundance of these two species, as it seems to be reflected in statewide capture totals (R. L. Hoffman, unpublished data). An apparent difference in habitat preference between the two species with a slightly greater numerical use of old fields by *N. tomentosus* is evident in Table 1. The difference in numbers captured in hardwoods vs old fields is insignificant, however ($X^2 = 0.714$, $P > 0.25$). Pine forests are almost completely avoided by this species ($X^2 = 50.4$, $P < 0.001$; April–September samples only).

Previous studies (e.g., Anderson, 1982; Lingafelter, 1995; Lomolino et al., 1995; Ratcliffe, 1996) have labeled *N. tomentosus* a habitat generalist. The above results suggest that it is less of a generalist in central Virginia than in other areas and almost completely avoids planted pine forests. Against the nearly equal distribution of both species in the two hardwoods sites, *N. tomentosus* showed an inexplicable and significant partiality ($X^2 = 12.50$, $P < 0.001$) for the southern old field (51 specimens) over the northern site (21). Ground-level vegetation was similar between these sites but OF-N had a greater density of vines and OF-S had more seedlings and young loblolly pine (Pagels et al., 1992).

Of the 138 captures of *N. tomentosus*, eight were taken in July. No others were trapped until the last two weeks of August, when a single beetle was captured. Thereafter, captures in September accounted for 24 in 1989 and 96 in 1990, six in October, and one in November. Peak activity for *N. tomentosus* was in September, at least a month later than peak activity for *N. orbicollis*. Curiously, the delayed adult activity by *N. tomentosus* is not evident in Nebraska, where only modest numbers were trapped during September (Table 2). The peak seasonal abundance patterns for *N. orbicollis* and *N. tomentosus* in Virginia appear to be unimodal with obvious seasonal shifts in summer versus fall, respectively. This difference may reflect the occurrence of two reproductive periods, the earlier perhaps consisting of adults which overwintered as pre-pupal larvae.

Although the respective units of each study site pair appeared much the same during their selection, many of the insects trapped, including the burying beetles, exhibited notable partiality for one habitat type or the other (R. L. Hoffman and J. C. Mitchell, unpublished data). Canopy cover varied from 86% in HW-N to 75% in

Table 2. Seasonal pattern of activity of *Nicrophorus orbicollis* and *N. tomentosus* in central Virginia (VA) compared to the patterns in Nebraska (NE) (Ratcliffe, 1996).

	N. orbicollis		*N. tomentosus*	
Month	VA	NE	VA	NE
April	31	0	0	0
May	114	58	0	0
June	115	432	2	186
July	772	2349	8	3157
August	549	5188	1	2413
September	157	597	120	182
October	9	214	6	98
November	0	0	1	0
Total	1747	8838	138	6036

HW-S and both were adjacent to small, perennial streams (Pagels et al., 1992). OF-S was adjacent to a small seep that had intermittent surface water during the study; no sources of water were near OF-N. Subtle differences in microhabitat also affect small mammal community structure; generalists are more often captured in hardwoods, whereas those with edge/old field affinities occurred preferentially in old field communities (Pagels et al., 1992).

The greater abundance of *Nicrophorus tomentosus* at higher elevations in Virginia, and its maximal surface activity in early autumn, suggests a somewhat more cool-adapted organism than the lowland-numerous, midsummer active *N. orbicollis*. The practical effect of these two largely sequential seasonal activity peaks might be reduction of competition for limited resources (dead mammals), already substantially achieved by the ability of *N. tomentosus* to forage in a habitat (old fields) largely avoided by *N. orbicollis*. This likelihood has been noted elsewhere and discussed by Trumbo (1990) and Scott (1998).

Results for *N. orbicollis* in our study confirm our prediction that it occurs more often in hardwoods than other habitat types. *Nicrophorus tomentosus* is not as much of a habitat generalist as expected but appears to have an aversion to planted pine forests, at least in central Virginia. Although these two species of *Nicrophorus* appear to have habitat preferences, their occurrence in all of the habitat types is beneficial because it allows them to sense food sources wherever they are found. Indeed, studies conducted in other places and times with different distributions of decomposing mammals among habitats should generate different results than we found for central Virginia. Their non-overlapping peaks of seasonal activity, however, correspond to patterns described in the literature (e.g., Trumbo, 1990; Scott, 1998) and may be more ingrained than their use of habitats.

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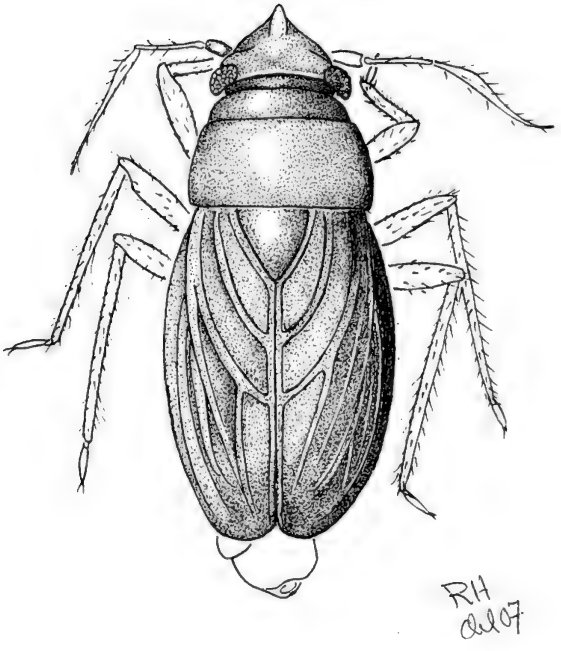

Nannocoris arenarius Blatchley, a rarely collected true bug (Heteroptera: Schizopteridae), length <1.5 mm; original drawing by Richard L. Hoffman (previously published as the back cover illustration for *Banisteria* 30).

Shorter Contributions

Banisteria, Number 40, pages 66-67

DISTRIBUTION OF THE FLIGHTLESS CARRION BEETLE *NECROPHILUS PETTITII* HORN IN VIRGINIA (COLEOPTERA: AGYRTIDAE). — The beetle family Agyrtidae (commonly referred to as "primitive carrion beetles") consists of about 60 species worldwide, 11 of which inhabit North America north of Mexico (Peck, 2001). *Necrophilus pettitii* Horn, the only member of this family found in the eastern portion of the continent, is a secretive, rarely collected carrion feeder that is primarily active in the cooler months of the year or inhabits cool habitats at higher elevations (Peck, 1981, 2005).

The range of *N. pettitii* extends from Vermont, southern Ontario, and Michigan south to Florida and Louisiana (Peck, 1981, 2005). Most of the available collection records are concentrated in the southern Appalachians (especially near the Tennessee-North Carolina border), with only one previously documented locality in Virginia (Peck, 1981, 2005). The latter site is Mountain Lake in Giles County (Peck, 1981).

During the past two decades, pitfall/drift fence (DF) trapping surveys conducted by staff of the Virginia Museum of Natural History (VMNH) and the Virginia Department of Conservation and Recreation, Division of Natural Heritage (VDCR-DNH), as well as others, have resulted in the accumulation of enormous series of carrion beetles (mostly various species of *Nicrophorus* and *Necrophila americana*, family Silphidae) from throughout Virginia. Included among these collections are more than 30 specimens of *N. pettitii* that greatly expand our knowledge of the distribution of this flightless species in the state. The following specimens are deposited in the VMNH and Arthur V. Evans (AVEC) collections:

Alleghany Co.: Warm Springs Mountain, Big Knob, 4 mi NE Covington, DF site 4, ca. 3800′, dry open woods, 15 May-7 October 2002, VMNH/USFS study (VMNH, 1).

Amherst Co.: Tarjacket Ridge, FS 1167, 3500′, 5 June 1998, J. Schilling (VMNH, 1).

Floyd Co.: 6 mi SE Willis, Rt. 726, Felker's property, 26 May 1995, J. M. Anderson, VMNH survey (VMNH, 2).

Grayson Co.: Grayson Highlands State Park, Haw Orchard Mountain Visitor Center, DF site 2, 17 September 1990, VMNH survey (VMNH, 1); Whitetop Mountain, DF site off FS 89, 5000′, 16 March-23 April

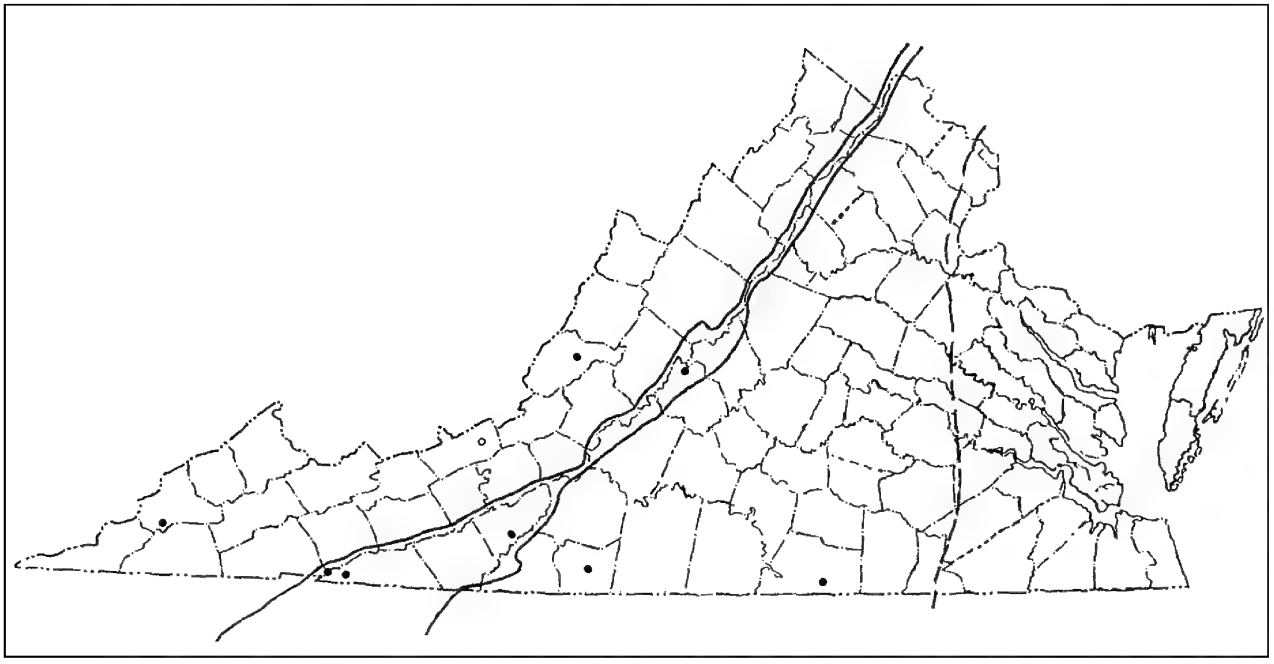

Fig. 1. Known distribution of *Necrophilus pettitii* in Virginia. Solid circles are new records and the open circle is a literature record (Peck, 1981). Solid lines indicate the limits of the Blue Ridge physiographic province and the dashed line marks the location of the Fall Line separating the Coastal Plain and Piedmont regions.

1994, VMNH survey (VMNH, 1).

Henry Co.: DuPont property near Martinsville, 1-7 November 1993, J. M. Anderson, VMNH survey (VMNH, 1).

Mecklenburg Co.: Elm Hill [now Dick Cross] Wildlife Management Area, 7.5 mi SE Boydton, 30 October-27 November 1995 (VMNH, 3), same but [27 November 1995? -] 24 February 1996 (VMNH, 5), all VMNH surveys.

Wise Co.: Powell Mountain Karst Preserve, ca. 1.3 km E Cracker Neck Church, Solomon's Seal Cave pitfall traps, 6-28 April 2009, C. S. Hobson and A. V. Evans, VDCR-DNH survey (AVEC, 1), same but 28 April-13 May 2009, C. S. Hobson and A. C. Chazal, VDCR-DNH survey (VMNH, 8), same but 13-27 May 2009, C. S. Hobson and J. F. Townsend, VDCR-DNH survey (VMNH, 10; AVEC, 1); same locality but rock outcrops at Parsons Cave, 12 May 2009, C. S. Hobson and A.C. Chazal, VDCR-DNH survey (AVEC, 1).

These new collections demonstrate that *N. pettitii* is much more widely distributed in the western portion of Virginia than was previously known (Fig. 1) and the species may be locally common (e.g., Wise Co. site). Four of the localities are in the Blue Ridge, two each are in the Ridge and Valley and the Piedmont, and the westernmost site is at the interface of the Ridge and Valley and Cumberland Plateau regions.

ACKNOWLEDGEMENTS

The Cave Conservancy of the Virginias funded a biological inventory of the Powell Mountain Karst Preserve by VDCR-DNH. We thank Stewart Peck and Arthur Evans for reviewing the manuscript. Dr. Evans also provided records of *N. pettitii* from his personal collection (AVEC; Richmond, VA).

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Banisteria, Number 40, page 67-68

A SECOND LOCALITY FOR *PHYTOCORIS HOFFMANI* HENRY (HETEROPTERA: MIRIDAE). — Henry (2009) described the plant bug *Phytocoris hoffmani* on the basis of two adult males collected by SMR (in a blacklight trap) in a red spruce (*Picea rubens*) forest in the Laurel Fork Recreation Area of the George Washington National Forest in Highland Co., Virginia. The type locality is within 0.3 km of the Virginia-West Virginia border at an elevation of approximately 3600 feet (1097 m) (SMR, pers. obs.). A full page color plate accompanied the description of this moderately large mirid. Although there are no definite plant associations for *P. hoffmani*, Henry (2009) speculated that red spruce would prove to be the host based on the species group to which it belongs. Limited subsequent beating by SMR of red spruce branches in northwestern Highland County has failed to yield additional specimens of this poorly known insect. Thus, RLH was pleasantly surprised to discover that sweep net samples obtained by SMR on 30 June 2010 from grassy bald habitats (elevation ca. 5400 ft/1645 m) near the summit of Whitetop Mountain in Grayson County, Virginia contained two more males of *P. hoffmani*. Whitetop is the second highest peak (5520 ft/1682 m) in the state and located at the common border of Grayson, Smyth, and Washington counties. The bald habitats along Forest Service Road 89 occur immediately downslope of the red spruce forest at the summit of the mountain. *Neolygus crataegi* Henry, another recently described plant bug, is currently known only from Whitetop Mountain and nearby Elk Garden; it is associated with hawthorns (*Crataegus* spp.) (Henry, 2007). The new record for *P. hoffmani* represents a southwestward range extension of about 170 miles/275 km (Fig 1). Both of the Whitetop specimens (and the holotype) are deposited in the Virginia Museum of Natural History, Martinsville, VA.

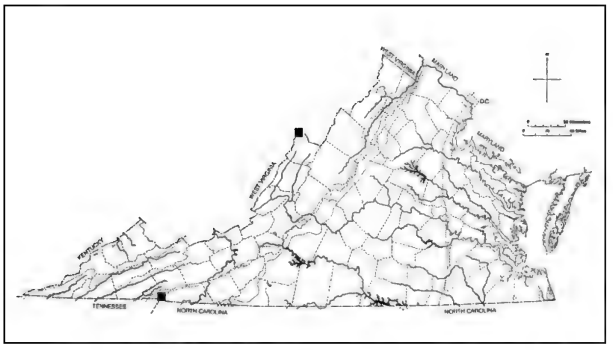

Fig. 1. Known distribution of *Phytocoris hoffmani* Henry.

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Banisteria, Number 40, page 68

DRASSYLLUS RUFULUS (BANKS), AN ADDITION TO THE GROUND SPIDER FAUNA OF VIRGINIA (ARANEAE: GNAPHOSIDAE). — Hoffman (2009) prepared the first list of Virginia "ground spiders" (Gnaphosidae), providing records for 45 confirmed species of an estimated state total of about 60 species. His paper listed 17 additional species that may occur in Virginia judging from their presence in neighboring states or other areas of the eastern United States. Subsequent processing of another portion of the large backlog of unidentified spiders at the Virginia Museum of Natural History has verified that one of these species, *Drassyllus rufulus* (Banks), inhabits Virginia. This species ranges from New Hampshire south to North Carolina and west to Texas and Colorado (Platnick & Shadab, 1982), and was previously documented in four of the five states bordering Virginia. Platnick & Shadab (1982) cited records for this species from 16 states and Ontario, but typically had only one record per state, perhaps suggesting that the species is widespread but uncommon. The Virginia record is based on the following collection from a drift fence-pitfall array operated by personnel of the Virginia Division of Natural Heritage: *City of Virginia Beach*, Little Creek Amphibious Base, 21 June 1989, K. A. Buhlmann (2♂).

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Banisteria, Number 40, pages 69-71

HYPORHAGUS PUNCTULATUS THOMPSON (COLEOPTERA: ZOPHERIDAE, MONOMMATINI) IN VIRGINIA. — *Hyporhagus punctulatus* Thompson (Coleoptera: Zopheridae) is the only member of the primarily tropical beetle tribe Monommatini (once recognized as a family and in earlier literature, spelled Monommidae) occurring in the southeastern coastal United States other than Florida, with literature and specimen records from Washington, DC to eastern Texas and north to Arkansas and Oklahoma. The first records from Virginia are presented here, some based on older museum specimens "rediscovered" or newly identified, and others on recent collections from regional surveys. Current classification of Zopheridae (Slipinski & Lawrence, 1999, 2010; Lawrence et al., 2010; Lord et al., 2011) includes not only the large "ironclad beetles" but many genera formerly in the Colydiidae. Monommatines have been commonly called "opossum beetles".

Freude (1955, 1993) recognized two subspecies, with *H. p. punctulatus* limited to the North American mainland and *H. p. anticus* Freude from the Bahamas and Antilles to northern South America. Nearly 70 species of the genus occur in tropical America. The distinctive dorsally sub-contiguous eyes (Fig. 1) serve to characterize these otherwise "plain" oval beetles, but in most dry specimens, the retracted head obscures them, probably leading White (1983) to use other key features for identification. Lord et al. (2011) provide diagnoses and images of all U.S. species.

Habits and habitats of monommatines were reviewed by Ivie (2002); they are generally associated with recently cut wood or rotting plant material. Many specimens of *H. punctulatus* are labeled as having been taken at lights in sandy forest habitats, e.g. a series from Little Cumberland Island, Georgia (WES), "at black light in open pine-live oak-juniper forest, sandy soil" or taken by beating vegetation e.g. "pine tops" (Löding, 1945). Kirk (1969) found it "on chinquapin blooms" and two North Carolina specimens are labeled "*Castanea dentata*" and "*Quercus*". A few specimens were reared from oak and sweetgum logs in upland forest sites of the Savannah River Site, South Carolina (Ulyshen & Hanula, 2009). Most specimens are from Coastal Plain localities but some southern Appalachian records have been found.

Published distribution records for *Hyporhagus punctulatus* are few, but specimens in the U.S. National Museum of Natural History (USNM), Smithsonian Institution, have been seen from all states within the known range and records (with images) on BugGuide (http://bugguide.net/node/view/209095/bgimage) have also added to state distributions, though the specimen from Indiana is probably mislabeled. The northernmost known locality is Washington, District of Columbia (Ulke, 1902), likely based on two specimens labeled "Washgtn. D.C. 24-6 / Coll. Hubbard & Schwarz" (USNM), probably collected in the 1890s. Since Brimley's (1938) record for Southern Pines, North Carolina, several specimens from across that state have come to our attention. Kirk (1969, 1970) gave South Carolina records for Clemson, Florence, Myrtle Beach, and Wedgefield; additional records are forthcoming (Ciegler, *in press*). Unpublished Georgia records (USNM) are from two barrier island localities. The species is common and widespread throughout Florida (Peck & Thomas, 1998) and Alabama (Löding, 1945). A few specimens (USNM) from Louisiana and Mississippi have been examined; Ivie (2002) listed *H. punctulatus* for Louisiana, and Richmond (1968) listed it from Horn Island, Mississippi. Specimens of *H. punctulatus* from eastern Texas have been examined, and Riley (2011) reported it from College Station. The listing for a species of *Hyporhagus* in Arkansas by White (1983) is likely based on a specimen of *H. punctulatus* and two recent specimens labeled "AR Little Rock" (USNM) have been examined. The Oklahoma specimen figured on BugGuide (http://bugguide.net/node/view/547640) is probably *H. punctulatus*.

Fig. 1. Frontal view of *Hyporhagus punctulatus* showing dorsally sub-contiguous eyes. Specimen from Frisco, Dare County, NC, in USNM; length of beetle 4.9 mm.

The following specimens examined substantiate the beetle's occurrence in the eastern part of Virginia; specimens examined in this study are deposited in either the USNM or the Virginia Museum of Natural History, Martinsville (VMNH). Label data are given verbatim, with commas inserted for clarity; inferred parts of abbreviated dates and names are bracketed, and breaks between labels on the same pin are separated by a forward slash: "Falls Church, Va., July 16-[19]14 / Hopk[ins]. U.S. 126652" (1 USNM) and same data except "126654" (1 USNM); "Falls Church, Va., IV-29-[19]'20 / L. L. Buchanan Collector" (1 USNM); "Fairfax Co., Va., IX-19-[19]'21 / Ernest Shoemaker Collection 1956" (1 USNM); "USA: VA, Charles City Co., V[irginia]C[ommonwealth]U[niversity] Rice Center, trap site 1, .15 mi. NNW admin. bldg., N37.32795° W077.20777°, 9-23 April 2010, A. V. Evans, deciduous woods, Lindgren trap" (1 USNM); same data except "W077.20577°, 23 April/7 May 2010, Malaise trap" (3 USNM); "VIRGINIA: Cape Henry, Seashore State Park, 10 June 1974, Don & Mignon Davis" (1 USNM); "VA: [City of] Chesapeake: Northwest River Park, ca. 5 mi SE of Hickory / 5-16 July 2004, Robert Vigneault" (1 VMNH); "USA: VA, Fauquier Co., Bull Run Mountains, High Point, N38.856600° W077.714091°, 23 March/14 April 2011, A.V. Evans, Lindgren funnel / *Hyporhagus punctulatus* det. A. V. Evans, 2011 VA BEETLE PROJECT" (1 VMNH); "VA: Halifax Co., Difficult Creek at CtyRt 719 / 4 mi E of Scottsburg, 9 May 2004, R.L. Hoffman, UV" (1 VMNH); "VA: Isle of Wight Co., Antioch Pines N[atural] A[rea] P[reserve], Blackwater River, bluff at gate / ca. 5 mi S of Zuni, 27 October 2010, S.M. Roble, UV" (1 VMNH); "VIRGINIA: Isle of Wight County, 6 km S Zuni at Blackwater River, 12 April 1989, W. E. Steiner / Under bark of small fire-killed oak, burned-over sand barren area" (1 USNM); "VA: Northampton Co.: Savage Neck Dunes Natural Area Preserve / Custis Pond, UV, 13 June 2003, [A.C.] Chazal & [D.P.] Field" (3 VMNH).

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Banisteria, Number 40, pages 71-72

NAMPABIUS FUNGIFEROPES (CHAMBERLIN), A BOREAL CENTIPED NEW TO THE FAUNA OF VIRGINIA (CHILOPODA: LITHOBIIDAE).

Hoffman (1995) prepared the first list of Virginia centipeds, accounting for 56 confirmed and 20 potential species. Three species were added to the state's fauna by Hoffman & Pereira (2002). Subsequently, Pereira (2009) described *Strigamia hoffmani*, a new species from the mountains of western Virginia, raising the total to 60 centipeds.

Within Lithobiidae, a speciose centiped family, the diminutive genus *Nampabius* is represented in Virginia by four species, including *N. turbator* Crabill, which is apparently restricted to cave environments (Crabill, 1952; Hoffman, 1995). Four other representatives of this genus were included in Hoffman's (1995) list of potential species for Virginia based on their occurrences in nearby areas of North Carolina or Tennessee. None of these species has since been documented in the state, but we herein report the discovery of a species of *Nampabius* that was not previously known to occur in close proximity to Virginia.

Chamberlin (1904) described *Lithobius fungiferopes* from Ithaca, New York, noting that this small (5-6 mm total length), mostly purple-brown centiped with a blackish head is "Not uncommon under fallen leaves in woods." Subsequently, he (Chamberlin, 1913) erected the genus *Nampabius* and transferred *fungiferopes* into it, where the species has resided ever since. In that paper, Chamberlin also reported *N. fungiferopes* from two localities in southern Vermont and noted that large individuals nearly attain 7 mm in total length. Bailey (1928) remarked that this species was "very common" throughout New York, but he only cited four localities, three of which are in the Finger Lakes region of the state. Citing Johnson (1952), Snider (1991) recorded *N. fungiferopes* from Presque Isle County, Michigan. These three northern states (Michigan, New York, and Vermont) remain the only known jurisdictions with documented records of this species (Mercurio, 2010). Thus, the following new locality adds considerably to the documented distribution of this small, litter-inhabiting centiped.

A berleseate of red spruce (*Picea rubens*) litter obtained by SMR on 19 October 2011 near the summit of Whitetop Mountain (ca. 5500 ft/1675 m) in the southern Blue Ridge Mountains ca. 6 km north of the Virginia-North Carolina border yielded an adult male *N. fungiferopes* in excellent condition (VMNH). This record extends the known range about 480 miles/775

km southwestward from Ithaca, New York (Fig. 1). The recent All Taxa Biodiversity Inventory of Great Smoky Mountains National Park yielded numerous specimens of the widespread congener *N. michiganensis*, but apparently none of *N. fungiferopes* (Discover Life in America, 2012).

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A VIRGINIA POPULATION OF *ALASMIDONTA TRIANGULATA* (LEA) (BIVALVIA: UNIONIDAE)? — Walking the shoreline of Buggs Island Lake at Oconeechee State Park, Mecklenburg Co., Virginia, in the fall of 1988, I found some mussel shells that were totally new to my experience. Reference to Johnson's (1970) synopsis of the Unionidae of the "Southern Atlantic Slope" provided an immediate identification: the specimens matched precisely the verbal account and photographs of a species treated under the name *Alasmidonta triangulata* (Lea).

However, granting this identification as reasonably correct only engendered a series of contingent problems. Described as *Margaritana triangulata* by Isaac Lea (1858) from specimens taken in the upper Chattahoochee River, Georgia, the species – *sensu* Johnson (1970) – seems to be both local and uncommon. Johnson could provide only a few collection records each for the Apalachicola, Ogeechee, Savannah, and Santee river systems of Georgia and South Carolina. Nor have more recent investigations revealed the species in the Atlantic drainage basins of North Carolina.

Aside from the biogeographic problem, a more substantive issue was raised by A. H. Clarke who, in his 1981 revision of *Alasmidonta* seriously challenged the status of *A. triangulata* as a valid species. An additional question is thus added to the foregoing list: is the characteristic shell shape (very large and obese, with large, elevated umbones; Fig. 1) only an ecophenotypic expression related to life in slow or still water of reduced oxygen content? Clarke (1981) went to some lengths to identify correlations between various environmental factors and shell form in the range of what he considered to be *A. undulata* (Say), and concluded that the traits attributed by previous authors to the nominal species *A. triangulata* only reflected geographic gradients from north to south and that the validity of that name could not be defended.

Alasmidonta undulata is widespread in south central Virginia as well as adjacent North Carolina (whence the Virginia Museum of Natural History [VMNH] received numerous samples from John M. Alderman). Mature specimens from the Chowan and Tar river systems (which thus bracketed the Virginia locality for "*triangulata*") differ slightly in shell form from more northern populations, but scarcely approach the facies of the Buggs Island Lake form, as might be expected if the latter was the product of geographic morphometric clines or trends. However, specimens in a series of 13 (VMNH 66) from the Little River in Johnston Co.,

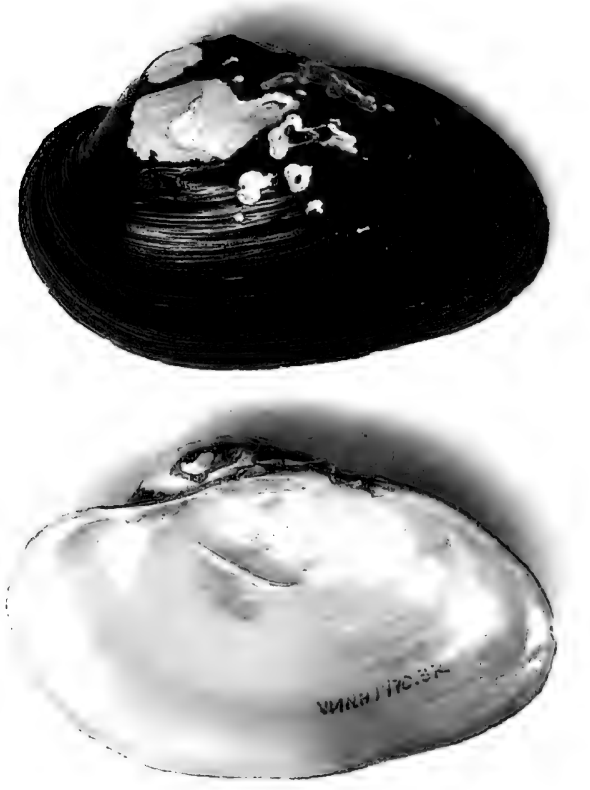

Fig. 1. Large adult of *Alasmidonta triangulata* (Lea), from Buggs Island Lake at Staunton River State Park, Halifax Co., Virginia (VMNH 1470.3). Length = 78 mm.

North Carolina, show marked increase in umbonal size and could readily be construed as intermediate in shell characters between the two forms, but subjectively closer to *A. triangulata.* That these mussels were taken from a small, flowing stream opposes the view that the obese shell form with high umbonal region represents only an ecophenotype adapted to still waters with low oxygen content. Clearly, the last word has not been written regarding the status of the three names *A. undulata*, *A. triangulata*, and *A. arcula* (Lea). For the present, I am inclined to the view that *A. triangulata* merits at least provisional recognition, an opinion shared by Dr. David H. Stansbery (pers. comm., following examination of Buggs Island Lake shells). Examination of soft-part structure is obviously a prerequisite for reliable identification, as well as an analysis of molecular genetic similarities.

VMNH has samples of shells with the following data: **Mecklenburg Co.**: Buggs Island Lake, inlet between Campground A, Oconeechee State Park and the boat ramp, 23 September 1988 (VMNH 56), 18 October 1988 (VMNH 58), 10 March 1990 (VMNH

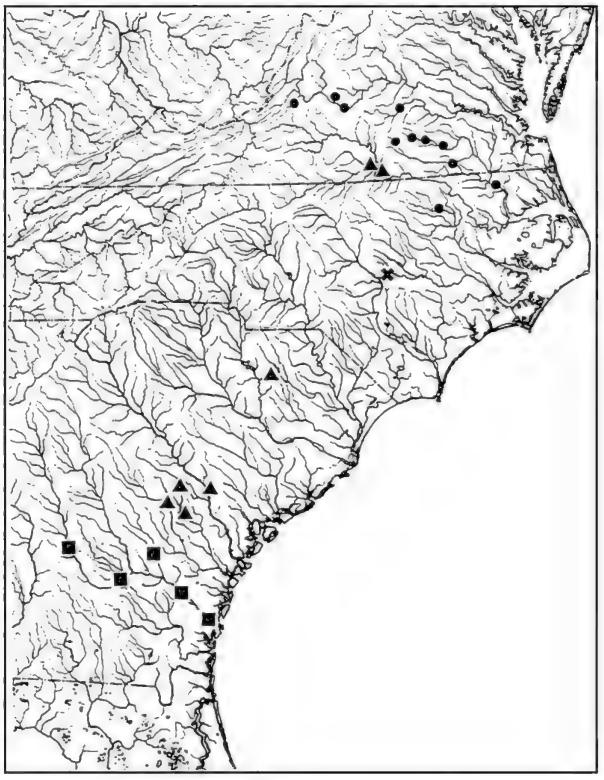

Fig. 2. Southeastern United States, with distributional records for *Alasmidonta triangulata* (triangles), *A. undulata* (dots), and *A. arcula* (squares). An intermediate population in the Little River, Johnston Co., North Carolina, is represented by the "X". Localities for *A. undulata* are from VMNH material; there are apparently no records for the species in the Roanoke River system.

1152), 3 January 1997 (VMNH 1436), and 18 December 1997 (VMNH 2046), all RLH leg.; **Halifax Co.**: Staunton River State Park, at confluence of Staunton (Roanoke) and Dan rivers, 9 November 1998, S. M. Roble and A. C. Chazal (VMNH 1470); also 150 m upstream of the previous site on the Staunton River side, 22 October 1997, A. Belden (VMNH 2048). These localities are about 13.5 km/8 mi apart, and imply that numerous additional population sites remain to be identified in Buggs Island Lake. Recovery of this mussel in the flowing reaches of the Dan and/or Roanoke rivers would provide further insight into the taxonomic status of this population. It is regrettable that no pre-impoundment material was ever taken from the Roanoke River. Since information about the genetic characters of the *undulata* group of *Alasmidonta* may offer the only hope for resolution of the status of *A. triangulata*, the location of a population of accessible individuals is much to be desired.

A brief summary of the distribution of the three species mentioned here may be of interest. The map (Fig. 2) is based largely on the records of Johnson (1970), since Clarke (1981) did not distinguish *A. triangulata*. Not having examined the material that Johnson listed from the Apalachicola River system, I do not know if it is referable to *A. triangulata*, but would suspect this to be the case inasmuch as the type locality of that name is "upper Chattahoochee River" (Lea, 1858), and since Johnson (1970) stated that the shell attains a length of 70 mm in the Apalachicola system. This would imply a range across the inner Coastal Plain of Georgia. *Alasmidonta arcula*, which was accepted as a valid species by Clarke (1981), appears to be endemic to the Altamaha River system (Fig. 2, squares), thus allopatric with *A. triangulata* in the south.

There seems to be little doubt that the *Alasmidonta* population in Buggs Island Lake is conspecific with those farther south. Whether it is native or unintentionally introduced remains to be determined. Inquiry of the Virginia Department of Game and Inland Fisheries disclosed that that agency has not stocked Buggs Island Lake with any fish from South Carolina or Georgia. However, the possibility of unintentional introduction of glochidia-infected hosts by fishermen cannot be excluded.

The presence of at least one population, intermediate with *A. undulata*, in eastern North Carolina also introduces the possibility that all three of the nominal species discussed herein may prove to be distinct geographic races.

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PHYLLOPHAGA LONGISPINA (SMITH), A NORTHERN MAY BEETLE NEW TO THE FAUNA OF VIRGINIA (COLEOPTERA: SCARABAEIDAE). — Originally described (Smith, 1889) as *Lachnosterna longispina* on the basis of three male specimens collected in Michigan (Grand Ledge) and South Carolina (locality not specified), this species has not figured frequently in subsequent literature. Adult host plants include members of the beech, dogwood, ebony, elm, heath, lily, maple, rose, walnut, and witchhazel families (Fattig, 1944; Luginbill & Painter, 1953). In their treatment on the North American May beetle fauna, Luginbill & Painter (1953) recorded *P. longispina* only from Ontario, Michigan, Indiana, Ohio, and Georgia, and noted that adults are present in May and June. Downie & Arnett (1996) merely repeated these same records. However, Brimley (1938) had recorded *P. longispina* from North Carolina (Sunburst, Haywood Co.; June and July records), McNamara (1991) listed it for Quebec, and McCutcheon et al. (1994) reported this species from six counties in West Virginia based on collections made between 20 May and 27 June. Of the 29 species of *Phyllophaga* recorded from West Virginia by these authors, *P. longispina* accounted for only 0.15% (n = 20) of the specimens examined. However, Utz et al. (2007) found that *P. longispina* was an important prey item (n = 58) of Brook Trout (*Salvelinus fontinalis*) in a Randolph County, West Virginia stream. Harpootlian (2001) recorded *P. longispina* from South Carolina (Oconee Co.), and Robbins et al. (2006) added Massachusetts and New Hampshire to the known distribution of this species. During the latter study, 106 specimens of *P. longispina* were collected at three of 59 trapping sites scattered throughout (mostly) eastern North America (no stations were in Virginia) among nearly 57,000 male *Phyllophaga* captures, thus representing only 0.19% of the total.

Phyllophaga longispina is added to the May beetle fauna of Virginia on the basis of the following blacklight trap collections made by staff of the Virginia Department of Conservation and Recreation, Division of Natural Heritage; voucher specimens are deposited in the Virginia Museum of Natural History (VMNH), Martinsville, Virginia, and Shenandoah National Park (SNP), Luray, Virginia:

Bath Co.: Warm Springs Mountain, 1 mi S of Virginia Route 39, [3100′], 4 June 1999, J. C. Ludwig (VMNH, 1). *Grayson Co.*: Grayson Highlands State Park, [vicinity of Virgil J. Cox Visitor Center, Haw Orchard Mountain, 4900′], 2 June 2011, S. M. Roble (VMNH, 12). *Page Co.* [all sites in Shenandoah National Park]: Betty's Rock, 3671′, 29 June 2005, A. C. Chazal and S. M. Roble (SNP, 4); Crescent Rock Overlook, 3551′, 7 June 2006, A. C. Chazal and S. M. Roble (SNP, 1); Mary's Rock, 3477′, 29 June 2006, A. C. Chazal and A. P. Hutto (SNP, 3); Pinnacles, 3754′, 29 June 2006, A. C. Chazal and A. P. Hutto (SNP, 1). *Rockingham Co.*: Shenandoah National Park, Dean Mountain Ridge, 3344′, 8 June 2005, A. C. Chazal and C. S. Hobson (SNP, 17).

This uncommon, primarily northern species has not been documented at other high elevation localities in western Virginia that have been sampled repeatedly (e.g., Buffalo Mountain, Burkes Garden, Peaks of Otter, Laurel Fork). Trapping at another site (red spruce stand near Massie Gap) in Grayson Highlands State Park one night earlier yielded several other species of *Phyllophaga*, but no specimens of *P. longispina.*

The North Carolina State University Entomology Department (NCSU) collection has three specimens of *P. longispina* captured recently in North Carolina by W. D. Merritt: Surry Co., Lowgap, April 2012 (1) and Watauga Co., Elk Knob State Park, 11 June 2010 (2). The former site is just south of the Virginia state line off the Blue Ridge Parkway. The recent All Taxa Biodiversity Inventory (ATBI) of Great Smoky

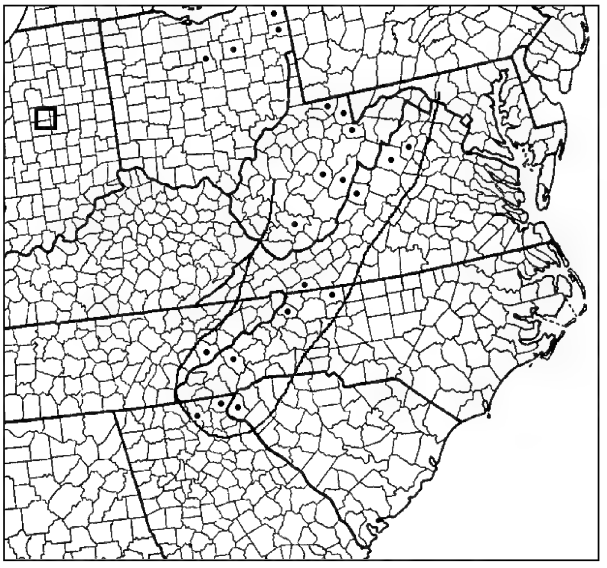

Fig. 1. County distribution (solid dots) and state records (square) of *Phyllophaga longispina* at the southern end of its range, with the inferred distributional limits (line). Records from VMNH, NCSU, Brimley (1938), Fattig (1944), Neiswander (1963), McCutcheon et al. (1994), Harpootlian (2001), Robbins et al. (2006), and Discover Life in America website (ATBI database). Luginbill & Painter (1953) recorded *P. longispina* from Indiana without details; Blatchley (1910) and Chandler et al. (1955) lacked records for that state.

Mountains National Park yielded specimens from at least three locations (Haywood Co., NC and Sevier Co., TN) in the park (Discover Life in America, 2012). Fattig (1944) recorded this species from three localities in northeastern Georgia. The distribution of *P. longispina* at the southern end of its range is confined to a rather narrow band along the Appalachians (Fig. 1).

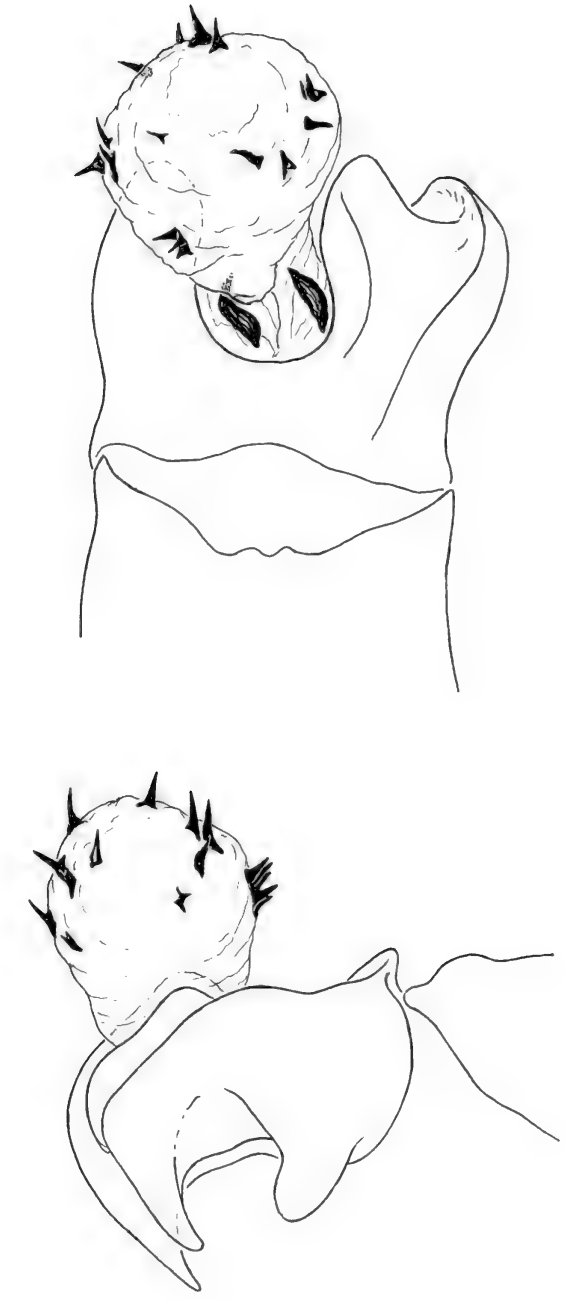

Fig. 2. Male genitalia, with expanded aedeagus, of *Phyllophaga longispina* from Grayson Co., Virginia (upper: dorsal view; lower: right lateral view).

Luginbill & Painter (1953) provided photographs of the genitalia of many species of *Phyllophaga*, including *P. longispina*, but the images are small and, for most species, only the configuration of the heavily sclerotized terminalia was shown. We take this occasion to provide drawings of the expanded aedeagus and male metatibial spurs (Figs. 2-3). The aedeagus has numerous small, subequal black spines dispersed generally over the surface. The lower unarticulated (fixed) spur of males is about as long as the upper articulated spur; both spurs are slender and acute (Luginbill & Painter, 1953).

ACKNOWLEDGEMENTS

The National Park Service provided funding for a biological survey of rock outcrops in Shenandoah National Park by the Virginia Department of Conservation and Recreation, Division of Natural Heritage (VDCR-DNH). We thank Wendy B. Cass of the park staff for her efforts to secure funding, lodging, and permits, and for coordinating the logistics of the project. Anne Chazal, Chris Hobson, and Angela Hutto of VDCR-DNH captured some of the specimens noted above. Dr. Arthur V. Evans identified many of the specimens cited in this paper and also reviewed an

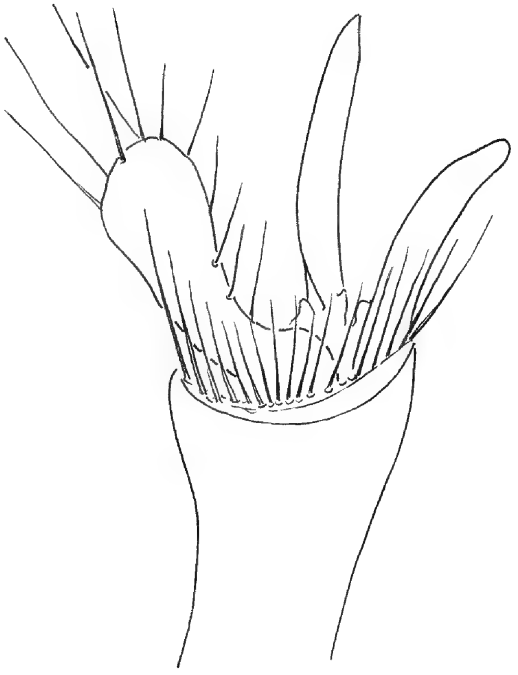

Fig. 3. Apex of metatibia of male *Phyllophaga longispina* from Grayson Co., Virginia.

earlier draft of the manuscript. Robert Blinn of the Department of Entomology, North Carolina State University, Raleigh, North Carolina generously provided records of *P. longispina* in the collection under his care.

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CALLIGRAPHA PNIRSA STÅL, A RARELY COLLECTED LEAF BEETLE NEW TO THE VIRGINIA FAUNA (COLEOPTERA: CHRYSOMELIDAE). — Leaf beetles comprise a large family (Chrysomelidae) of about 1,700 species in North America (Riley et al., 2002). Staines & Staines (2009) recorded 555 species and seven subspecies in 133 genera in the Mid-Atlantic region (defined as the seven states from NJ to NC, west to WV; also DC). Their summary revealed that the Virginia fauna includes 382 species (and four subspecies) in 110 genera, ranking the state's diversity above the totals for Delaware, New Jersey, Pennsylvania, West Virginia, and the District of Columbia, but below those for Maryland (404 species and three subspecies) and North Carolina (391 species and six subspecies). Although some leaf beetles are of considerable economic importance, the biology, host plants, and immature stages of most species are unknown (Staines & Staines, 2009).

Twenty-one species of *Calligrapha*, a genus which contains many intricately-marked or "showy" beetles (some with metallic coloration), have been recorded from the Mid-Atlantic region (Gómez-Zurita (2005; Staines & Staines, 2009), accounting for more than half of the 37 species known from North America north of Mexico (Riley et al., 2002). Ten species were listed for Virginia by Staines & Staines (2009), but Gómez-Zurita (2005) reported that *C. confluens* Schaeffer is also known from the state, citing Brown (1945).

Within the Mid-Atlantic region, *C. pnirsa* Stål, a rarely collected species, has been recorded only from North Carolina and Pennsylvania (Staines & Staines, 2009). Wray (1967) cited a specimen collected by O. L. Cartwright on 6 June 1939 at Sunburst (Haywood Co.) in western North Carolina. Historically, this species was reported only from Ontario, Quebec, Minnesota, Indiana, and North Carolina in North America (Brown, 1945; Wilcox, 1972), but the holotype purportedly was collected in Costa Rica (see Stål, 1862; Jacoby, 1880-1892). Blackwelder (1946) listed the species with uncertainty for both Costa Rica and the United States. Recent reports and surveys have added Ohio (Clark, 2000), Kentucky (Barney et al., 2008), and Great Smoky Mountains National Park (Carlton, 2012) to its known distribution in the United States. *Calligrapha pnirsa* was not mentioned in summaries of the state chrysomelid faunas for Alabama (Balsbaugh & Hays, 1972), Florida (Peck & Thomas, 1998, 2012), South Carolina (Ciegler, 2007) or West Virginia (Clark, 2000), and Gómez-Zurita (2005) did not encounter any new state records of this species from anywhere within its range during his recent examination of more than 2,000 specimens (mostly from the USNM collection) of this genus.

Despite the lack of published records for Virginia, a specimen of *C. pnirsa* was collected by RLH more than 30 years ago in the far southwestern portion of the state: *Washington County*: Abrams Falls near Bristol, 6 June 1979, R. L. Hoffman & R. E. Batie, RU 9031. **NEW STATE RECORD.**

The specimen readily keys out to *C. pnirsa* using Wilcox (1972) and remains the only known example of this species from Virginia. It is orange with extensive black markings and exhibits a pattern (Fig. 1) that closely resembles Figure 69 of Wilcox (1972: 30), and is similar to the pattern illustrated (presumably of the holotype) in color plate 11, figure 18 in Jacoby (1888-1892).

We visited the Abrams Falls site on 24 August 2011 in an effort to obtain additional material but did not observe *C. pnirsa* on that date. RLH also visited the site on several other occasions after the species was found there, but never saw another specimen. With this new record, the *Calligrapha* fauna of Virginia is increased to a dozen species, more than twice the figure (n = 5) used by Gómez-Zurita (2005: 97) in his map of state/province and latitudinal diversity within this genus.

Many species of *Calligrapha* feed on plants of little economic importance, or if their food plants are of some economic importance, they only rarely reach pest status (Brown, 1945; Wheeler & Hoebeke, 1979). Ainslie (1925) reported that *C. pnirsa* is associated with basswood (*Tilia americana* L.), a tree that is also fed upon by several more northern congeners (e.g., *C. amator* Brown, *C. tiliae* Brown, and *C. virginea* Brown; Brown, 1945; Wilcox, 1972). Future sampling in Virginia forests containing basswood may yield additional records of *C. pnirsa*. Within the state, this tree is typically found in rich cove forests, or areas containing mafic or calcareous soils (primarily in the mountains), or in marl ravines associated with fossil shell deposits in the Coastal Plain (Virginia Botanical Associates, 2012).

ACKNOWLEDGEMENTS

Karen Francl provided SMR access to the insect collection at Radford University (RU). Bill Tindall and Susan Fiene facilitated our 2011 visit to Abrams Falls. Al Wheeler and several anonymous reviewers provided helpful comments that improved the manuscript.

Fig. 1. *Calligrapha pnirsa* specimen (Radford University 9031) from Abrams Falls, Washington County, Virginia. Top: Dorsolateral view. Middle: Laterodorsal view. Lower left: Dorsoanterior view. Lower right: Dorsoposterior view.

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Authors at Abrams Falls, Washington Co., VA, 24 August 2011, photo by Bill Tindall.

Banisteria, Number 40, pages 81-83

AN INLAND OCCURRENCE OF THE GRASSHOPPER *LEPTYSMA MARGINICOLLIS* (SERVILLE) IN VIRGINIA (ORTHOPTERA: ACRIDIDAE: LEPTYSMINAE). — Several years ago, while the first author was collecting insects beside an impoundment of the Slate River in Buckingham County, Virginia, his attention was engaged by the curiously squirrel-like escape behavior of a small agile grasshopper that was present in considerable numbers on emergent vegetation. When disturbed by the observer's close approach, individuals would fly quietly to a nearby stem of a large rush (*Juncus* sp.), and upon landing move quickly to the opposite side. By hugging the rush stem closely, the grasshoppers became effectively concealed both by their position and coloration (gray-brown) that matched the plant closely. After a few failed capture attempts using thumb and forefinger, RLH learned to simply reach around the stem with his cupped hand and seize the fugitives *in situ*. Relying on passive evasion, they rarely took flight to escape this strategy. Investigation of the Slate River at two road crossings (County Routes 746 and 642) downstream from the impoundment west of Andersonville disclosed no lentic habitats that might accommodate this insect.

The unfamiliar grasshopper was quite distinctive, being slender and elongate with a pointed head and three-sided antennae, and possessing a whitish stripe that extended from the eye to the base of the hind legs. Reference to Blatchley's (1920) manual of eastern orthopterans quickly provided identification as *Leptysma marginicollis* (Serville), an austral species stated to range from Maryland to Florida, thence west to southern California and Texas. Capinera et al. (2004) gave the range as Maryland to Florida, west to New Mexico and Colorado. The common name of "cattail toothpick grasshopper" that has been applied to this species by various authors (e.g., Helfer, 1987; Capinera et al., 2002, 2004) seems appropriate. Both Capinera et al. (2002) and Capinera et al. (2004) provided a color image of the species and numerous color photos are available on BugGuide.net (2012) and other internet sites (e.g., Flickr.com). The range of the nominate subspecies was listed by Roberts (1977) as Virginia to Florida and west to Kansas and Texas; also extreme north central and eastern Mexico (Chihuahua, Tamaulipas, and Veracruz). Two other subspecies and four congeners occur farther west and south (to Argentina) (Roberts, 1977; Eades et al., 2012).

The unusual escape behavior of *L. marginicollis* had been reported previously by a number of authors (e.g., Dakin & Hays, 1970; Capinera et al., 2002, 2004). This species always remains on vegetation, never alighting on the ground, and flies to another plant when disturbed, often travelling "considerable distances" in the process (Dakin & Hays, 1970).

A search through the VMNH grasshopper backlog produced a number of additional specimens from Virginia, nearly all of them from the Coastal Plain. The list of Virginia Orthoptera by Fox (1917) provided additional records from the same region, as did the more extensive coverage of the southeastern United States by Rehn & Hebard (1916). Those authors cited many collections (ANSP), including Piney Point, Maryland, and Washington, DC. Davis (1926) did not record *L. marginicollis* during his surveys near Wingina in Nelson County nor did Hebard (1945) find it in Bath and Highland counties farther west. Also, Arquette et al. (2010) lacked records from the Virginia barrier islands. To our knowledge, there are no documented records of this species from the lower Delmarva Peninsula. Recent photographs of live Virginia specimens of *L. marginicollis* from Prince William County (two sites in Woodbridge) and Williamsburg are posted on the BugGuide.net and Flickr.com websites.

The range of *L. marginicollis* in North Carolina extends west as far as Charlotte and Greensboro (Brimley, 1938; Rehn & Eades, 1961; NCSU specimens). Both of these localities are in the Piedmont, but like its distribution in Virginia, this species is largely confined to the Coastal Plain region of that state (Rehn & Eades, 1961). At least six North Carolina counties are represented by recent on-line photos of this species, all but one from the Coastal Plain or Sandhills regions of the state. The generalized range map for *L. marginicollis* in Capinera et al. (2004) implies that the species occurs statewide in both Virginia and North Carolina, but VMNH and other records are in closer agreement with the Virginia localities and map presented in Rehn & Eades (1961). These sources indicate a primarily coastal distribution in Virginia, with no known records west of the population recently discovered in Buckingham County (Fig. 1).

Leptysma m. marginicollis is represented in the VMNH collection by 41 specimens from the following Virginia localities:

Buckingham Co.: Slate River impoundment at public boat launch facility, 4 mi W of Andersonville (37.27.30N, 78.38.34W), 14 October 2002, R. L. Hoffman (5); same but 10 April 2009 (1). *Caroline Co.*: Fort A. P. Hill, 13 September 1993, S. M. Roble, VDNH survey (1); Fort A. P. Hill, Madison Pond, 21 June 2005, S. M. Roble, VDNH survey (2); Fort A. P. Hill, Ware Creek beaver ponds, 20 September 2005,

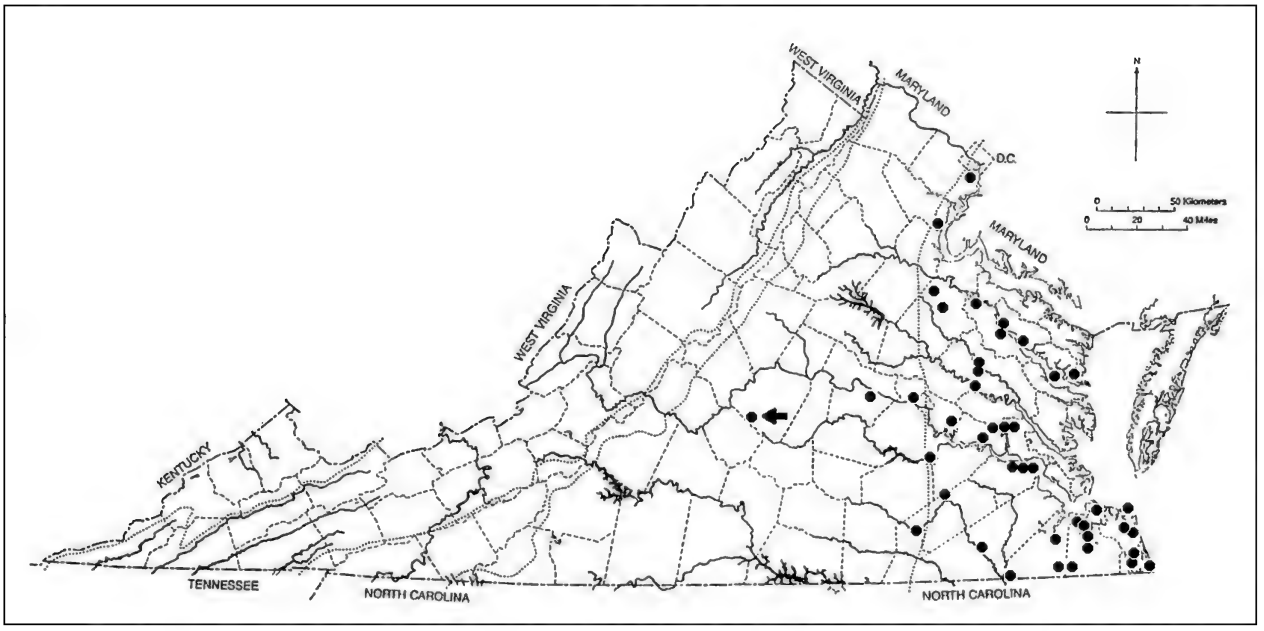

Fig. 1. Known distribution of *Leptysma m. marginicollis* (Serville) in Virginia, based on specimens in the Virginia Museum of Natural History and literature records (Rehn & Hebard, 1916; Fox, 1917; Rehn & Eades, 1961). The arrow marks the location of the Buckingham County population.

S. M. Roble and A. C. Chazal, VDNH survey (2). *Henrico Co.*: Glendale, 25 September 1960, A. Morrow (1). *James City Co.*: Edwards Swamp, 3 July 1990, K. A. Buhlmann, VDNH survey (1). *King William Co.*: Pamunkey River, Broad Creek marsh, 17 June 1999, A. C. Chazal and S. M. Roble, VDNH survey (1). *New Kent Co.*: Diascund Creek, 29 April 1991, K. A. Buhlmann, VDNH survey (2). *Powhatan Co.*: Fine Creek Mills, 24 April 1990, C. A. Pague, VDNH survey (1). *Prince George Co.*: Petersburg, 25 September 1960, Blackburn (1). *Prince William Co.*: Quantico Creek, 21 September 1998, A. C. Chazal and J. C. Ludwig, VDNH survey (1). *Sussex Co.*: Cherry Orchard Bog Natural Area Preserve, 27 May 2005 (1) and 29 May 2008 (1), both S. M. Roble and C. S. Hobson, VDNH survey (1). *City of Richmond*: University of Richmond campus, various dates [1933-1939], student collectors (10, all ex UR collection). *City of Suffolk*: South Quay pine barrens, ca. 6 mi S of Franklin, 24 October-16 December 2002, S. M. Roble, VDNH survey (2). *City of Virginia Beach*: Dam Neck Navy Base, 6 June 1990, K. A. Buhlmann, VDNH survey (1); False Cape State Park, 18-20 May 1998, S. M. Roble, VDNH survey (4); North Landing River, 10 March 1990 (1) and 15 May 1992 (1), both K. A. Buhlmann, VDNH survey; Oceana Naval Air Station, 18 October 2001, K. L. Derge and A. C. Chazal, VDNH survey (1).

Leptysma marginicollis preferentially consumed cattail (*Typha* spp.), pickerelweed (*Pontederia cordata*), Mexican seedbox (*Ludwigia octovalvis*), and soft rush (*Juncus effusus*) in laboratory feeding trials (Squitier & Capinera, 2002). An earlier study determined that this grasshopper restricts its feeding to cattails, grasses, and sedges, and that oviposition occurs endophytically in early spring (Hilliard, 1982).

In Virginia, *L. marginicollis* is "common locally in tidal marshes, where it occurs most frequently in the areas of *Scirpus americanus*, largely avoiding the true salt marsh grass, *Spartina glabra* [= *S. alterniflora*]" (Fox, 1917). Fox also noted that it is found in grassy or cattail wetlands at the head of tidal streams and grassy thickets bordering coastal streams. Near Tappahannock, adults were on *Andropogon* in dry upland fields in late April (Fox, 1917). Rehn & Hebard (1916) reported that this species inhabits tall reeds and grasses in marshes and swamps, as well as "wet spots in pine woods." They also found it in high bushes bordering a gum swamp near Wilmington, North Carolina. More sampling of vegetated wetlands in the Piedmont region of Virginia (and perhaps areas farther west) may result in the discovery of additional populations of this interesting species.

ACKNOWLEDGEMENTS

Most VMNH specimens of *Leptysma marginicollis* were collected by staff of the Virginia Department of Conservation and Recreation, Division of Natural

Heritage. We thank the various current and former zoologists for their efforts and donation of this material. Robert Blinn allowed access to the entomological collection at North Carolina State University (NCSU). Al Wheeler and Joe Mitchell provided helpful comments on the manuscript.

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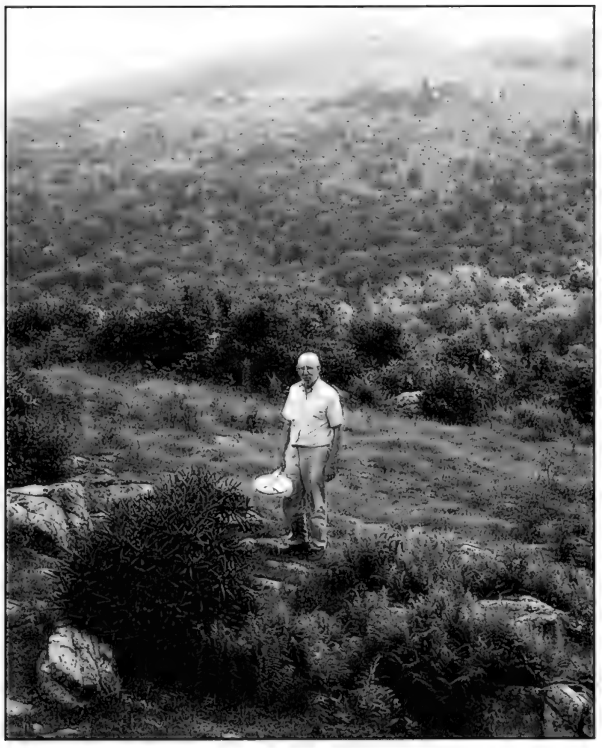
Essays by Richard Hoffman

Banisteria, Number 40, pages 84-86

The High Country: Biologically Unique[1]

by Richard L. Hoffman



Author collecting insects on Wilburn Ridge in Grayson Highlands State Park. Photo by Patti Dalton.

In the Asiatic country of Indonesia, in the volcanic island chain lying to the east of Java, two small islands called Bali and Lombok are separated by a narrow passage of about 25 miles wide. On a clear day you can stand on one and see the other. To naturalists, this narrow strait is one of the most remarkable places in the world because it separates two major groupings of animal life. The butterflies, snails, millipeds, reptiles, birds, and mammals of Bali are like those of mainland Asia, while their counterparts on Lombok are shared with the great southern island of Australia. It is almost unbelievable that such differences can occur virtually in contact.

So who would believe my next statement, that one can find nearly as dramatic a biotic contrast right here in Virginia, and by driving not 25 miles, but just 10? Where do we have such differences in plant and animal life? Between Norfolk and the Eastern Shore? Between the Dismal Swamp and Cape Henry? No, on all counts! One can easily see the truth of my assertion in an easy drive of about two hours, starting at Abingdon and going east on U.S. 58. If you are a naturalist stocked with the right expertise, you probably will understand what is to come without following this narrative. If not, let my words guide your eyes as we proceed.

Abingdon lies in the central low plateau of Washington, Smyth, and Wythe counties. When driving southwest on Interstate 81 one sees tall mountains running parallel, both to the north and south. The elevation at Abingdon is about 2,000 feet above sea level, and its climate is like that of Danville. There are other similarities with the Virginia Piedmont that appear climate-related. Sweetgum is common nearby along the North Fork Holston River, mud salamanders live in the springs, and narrowmouth toads have been found not far away. Persimmon, which does not exist in the Blue Ridge or the New River Valley, shows up again as a common tree. Collectively, many plants and animals in this region are adapted to hot summers and mild winters, and are the common species one finds in Alabama or at South Boston.

On the way east from Abingdon on U.S. 58, the road crosses the Middle Fork of the Holston River, one of the headwaters of the Tennessee River system. That system brings into Virginia our richest faunas of turtles, crayfish, mollusks, and fishes, all having originated in the Mississippi River basin. We may pass in silence over the Holston, in memory of its former wealth of unionid mussels, decimated in recent decades by upstream pollution.

From Damascus, the road clings to the course of Laurel Creek through a sinuous valley of spectacular rhododendron stands, rock outcrops, and waterfalls, gaining altitude as it goes. U.S. 58 then makes an abrupt turn to the right, on its long way eastward. We part its company to continue directly ahead, following a broader and flatter intermontane valley at nearly 4,000 feet, skirting the western base of the two great mountains, Whitetop and Mount Rogers. This is a settled and farmed country, green and well-watered, with a totally different aspect than that seen at Abingdon.

Our pleasant paved road continues toward Troutdale, past the campgrounds and other amenities provided by the National Recreation Area. At

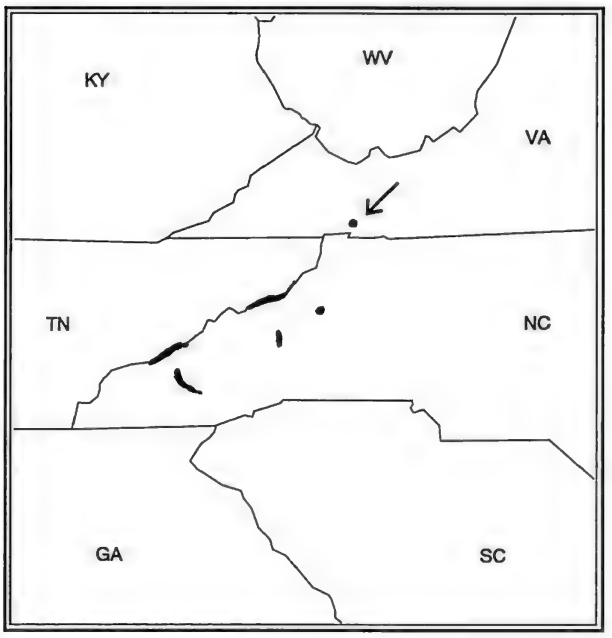
[1]Originally published (with an additional photo) in the Spring 1995 issue of *Virginia Explorer* (volume 11, number 2, pages 16-18). Reprinted with permission of the Virginia Museum of Natural History, Martinsville, VA. (The photo on page 86 was not included in the original article).

Konnarock we turn onto State Route 600, and immediately commence an uphill grade of about four miles. One's eardrums "pop" in response to the decreasing atmospheric pressure. In a short time, we arrive at a broad open meadow called Elk Garden Ridge, the pass between Mount Rogers and Whitetop. The Appalachian Trail crosses the road here, and the Forest Service has provided a spacious parking lot for the convenience of hikers, which we are about to become. The elevation is about 4,800 feet and if the weather is clear, one can easily see the dark-green fir-capped dome of Rogers and a world of blue-gray ranges overlapping off to the distant east.

From this point the Appalachian Trail passes through a rustic stile and continues on its way toward Maine. If we follow it for only a few miles, the forest changes perceptibly: first a broad belt of native buckeye with its singular five-parted leaves. In May the ground is carpeted with fringed phacelia, a native of the high southern Blue Ridge. It occurs no further north in Virginia, and no lower than about 5,000 feet. Still farther on the buckeye merges into beech woods, with a seasoning of red spruce and striped maple. Occasional breaks in the forest permit views southward into the high country of North Carolina toward Boone. The horizon is dominated by Three-top Mountain, Trout Knob, and a dozen others reaching up at least a mile. It is difficult to imagine that in the early part of this century, today's quiet trail was a busy logging railroad, hauling away the boles of centuries-old red spruce. As recently as the late 1940s, one could find the sites of old sawmills and rusting heaps of machinery being slowly recycled by natural forces.

In another mile or two the trail becomes more precipitous and enters the dark green forest of Fraser fir. Although related to the more northern relatives, Fraser fir is a species endemic to the highest mountains of the southern Appalachians (*see illustration above*). It occurs nowhere else in Virginia than at this soft crown on the last 200 vertical feet in the Commonwealth. At its highest point (nearly flat and a little disappointing for it), one can find a survey marker, where the state peaks out at 5,729 feet above the Chesapeake.

Besides the pervasive fir, what else occurs in such exalted surroundings? In the summer, the ground is carpeted with the northern wood sorrel, a creeping plant notable for the delicate red-veined white petals of its strawberry-like flowers. This plant likes high country: it ranges from the Great Smokies north through the Appalachians to Canada, Alaska, and northern Eurasia. I have found it growing under spruce in the Austrian Alps, where the plant communities looked identical to those I know in the highest Appalachians. It is therefore something of a shock to discover that Alpine animals



Map of the southern Appalachian region, showing the present distribution (dark spots) of Fraser fir. Mount Rogers is indicated by the arrow. The species is a climatic relict, isolated on mountains about 5,000 feet above sea level by gradual warming trends over the past 17,000 years. Map by John Anderson.

lack such counterparts in our mountains: the millipeds and salamanders are totally different! The Fraser fir provides a home for the northern flying squirrel, another animal widespread across northern North America in evergreen forests that occurs far to the south atop the highest Appalachian peaks.

Only a few hours ago we were ten miles to the west, and nearly a mile lower, yet what a difference in the natural communities! It is easy to realize that climate makes the difference, and that elevation changes the climate. Going upward lowers the average daily and annual temperature, and shortens the growing season. The beeches on Mount Rogers don't begin to bud until early June. What makes the high country around Mount Rogers so interesting biologically, and unique within the state, is the climatic stratification that results from the elevation.

Several major distributional patterns can be defined for the region. They include:

1) Southern Appalachian high-altitude endemics that reach their northernmost extent. Besides the fir and fringed phacelia, numerous millipeds, beetles, and especially salamanders make up this component. One delight of the evergreen forest is the discovery, under moss or stone, of the elegant gold-flecked Weller's

salamander, or the diminutive Pygmy salamander with its dorsal pattern of neat herringbone markings. Of similar range, but preferring lower elevations, are the aquatic shovel-nosed salamander that inhabits a few streams draining the northern slopes of Rogers and Whitetop, and the aptly named umbrella-leaf that displays its spectacular foliage in springs and seeps northward almost as far as Troutdale.

2) Canadian (even Eurasian) species that, like red spruce, northern flying squirrel, and wood sorrel, island-hop southward at ever-increasing elevations as far as the Smokies. In Virginia they rarely occur below 4,000 feet.

3) At moderate elevations (2,000-4,000 feet) one finds a multitude of southern Appalachian plants and animals that extend farther northward. Some follow the Blue Ridge nearly to Roanoke; others cross over northwest into the Alleghanies toward Tazewell or Bluefield.

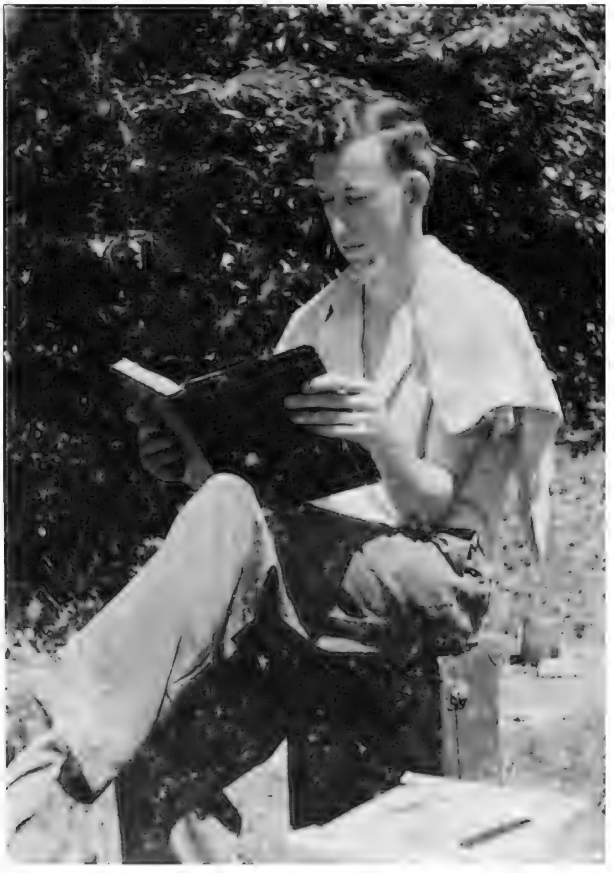
4) Also at moderate elevations are organisms whose loyalty is still to cooler climates, but range from north Georgia into New England or Canada. Many of these are widespread in the mountains of western Virginia, preferring cool ravines or north-facing slopes of the ridges.

Well, has my point been made? At the top of Rogers, at rest in the moss while kinglets fidget in the nearby firs, we are surrounded by plant and animal species making up a community more similar to that of Quebec than to anything elsewhere in Virginia. Virtually none of them occur around Abingdon, easily visible from the open fields on Whitetop. Correspondingly, the plants and animals of the Holston Valley have far more in common with those of Tuscaloosa or Atlanta. The differences are on a scale comparable to those mentioned for the East Indies. To summarize: the distribution of land organisms is controlled by climate, which in turns is determined by latitude or elevation. End of lesson.

One needn't be a trained biologist to appreciate what I've tried to describe. Get in your car some fine day and see for yourself. For those who prefer to enjoy nature in comfort, a good road runs to the very top of Whitetop, and the scenery alone is worth a drive from Norfolk. Flatlanders should go in May, when the woods have leafed out fully, to experience completely the sensation of turning back the calendar. At the elevation of Galax and Hillsville, many trees will only be starting to leaf, and at Grayson Highlands State Park, you're back into March – all on the same day.

I routinely offer up two small prayers of thanks. First, that the boundary with North Carolina was started where it was. Had Colonel Byrd started his survey of the line just ten miles further up the coast, Virginia would have no Mount Rogers, which is arguably the most beautiful place in the state, as well as one of the most biologically significant. Second, gratitude that the region is under the protection of the National Recreation Area, which will preserve those attributes for the enjoyment of future generations.

Dr. Richard L. Hoffman is Curator of Recent Invertebrates at VMNH in Martinsville.



Richard L. Hoffman in the field at Mount Rogers, Virginia, 1947 (photo provided by Richard L. Hoffman).

Banisteria, Number 40, pages 87-89

A Garden of Biotic Delights[1]

by Richard L. Hoffman

Burkes Garden is the premier biological hotspot in Virginia, and for one scientist who has visited it for over 50 years, it is an endless source of discovery and renewal.

The word garden is used worldwide to denote a place that offers either nutritional or emotional gratification. One dictionary states, "Any fertile, highly cultivated territory remarkable for the beauty of its vegetation." After all, consider the Garden of Eden as a prototype!

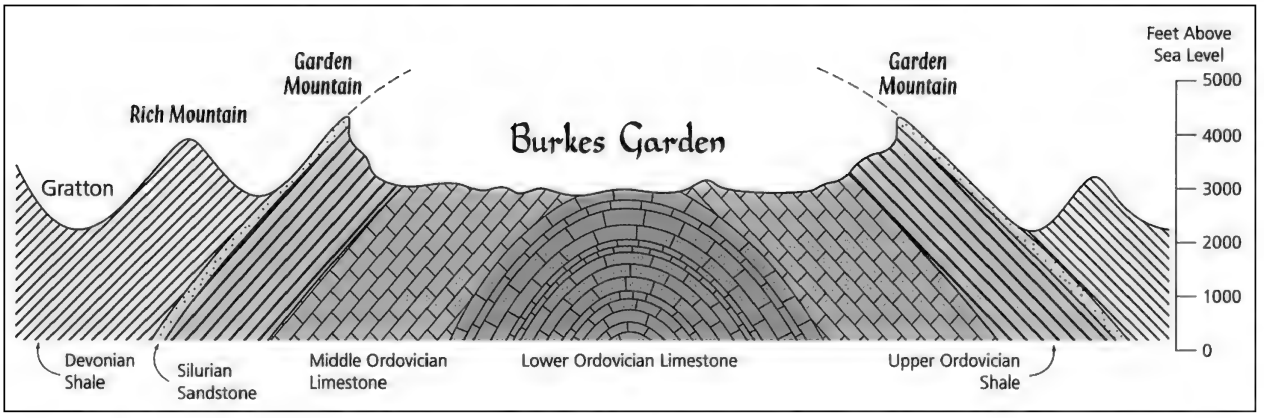
Just a little extension of the concept lets us imagine a garden of intellectual pleasures, and from the standpoint of natural history, Burkes Garden fulfills all expectations and more. For years I have asserted to one and all that it is in fact **THE** premier biological hotspot in Virginia, if not the entire southern Appalachian region. How can such a sweeping generalization be justified?

The traditional idyllic garden usually owes its singularity and charm to a specific combination of factors: climate, landscape, position. Exactly the same factors combine to give Burkes Garden an unrivaled diversity of plant and animal life. Central physiographic position in the Appalachians, sufficient elevation to provide northern climate, diversity of underlying rock and soil types and abundant rainfall all contribute to the overall effect.

[1]Originally published (with additional photographs) in the Spring 1996 issue of *Virginia Explorer* (volume 12, number 2, pages 7-11). Reprinted with permission of the Virginia Museum of Natural History, Martinsville, VA.

Structurally, Burkes Garden, located in the northeastern sector of Tazewell County, is what geologists call a breached anticlinal dome. It is eight miles east to west, and five miles north to south (*see diagram below*), and is formed in the shape of a bowl turned upside down. The rim of this bowl is today's Clinch Mountain, averaging about 4,000 feet along most of its crest but welling up to 4,700 at Beartown Mountain, at the western end. Anticlinal valleys are common in the Appalachians, but are typically long and slender, usually canoe-shaped. They are formed when sedimentary beds are forced upward into long parallel-sided arches. As erosion removes the tops of the mountains formed, the softer limestones inside are exposed to erosion, while the surrounding, overlying beds of resistant sandstone remain as the crests of modern ridges. Burkes Garden's size and shape alone are unique within the entire Appalachian system, and both provide the foundations for the singular biodiversity that has developed there.

My first visit to the Garden was in 1946, when, as a university sophomore, I was following the trail of a suspected new type of salamander. My source, a Smithsonian zoologist who combed Virginia for butterflies, painted an irresistibly compelling picture of the region and its fauna. That first quick trip – made back when the main access road from Tazewell was still unpaved and when one could acquire Burkes Garden land only by marrying into it – was immediately addictive. In 1947 I went back with a friend for three days and nights. We camped "out" inside a cave full of long-eared bats, scaled Beartown Mountain, and came away with many good discoveries in our bottles. After the lepidopterist just mentioned and a botanist of the same era, I think we were the first naturalists to collect at the Garden. And repeated visits over the next fifty years – often three or four times a summer – have continued to provide new and fascinating finds.

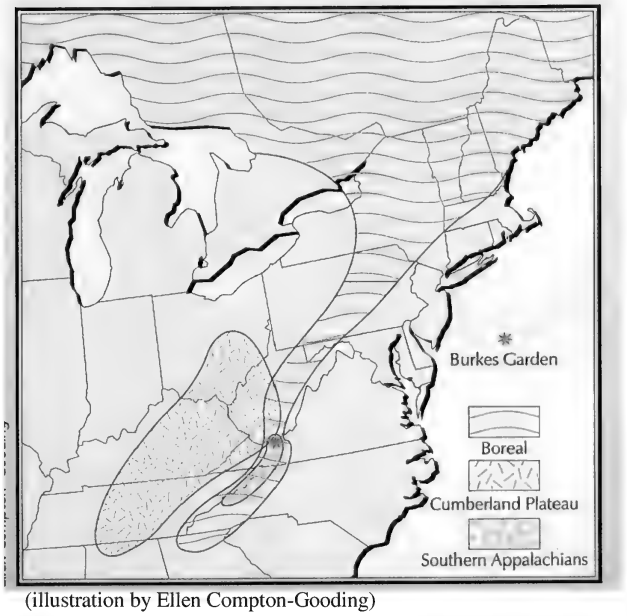


(illustration by Ellen Compton-Gooding)

What produced a mix of living ingredients brought together at this particular landscape in southwestern Virginia? Organisms adapt to specific environmental regimes, climate being one of the most important. Since mountains tend to be colder than lowlands, those species which have evolved in cool environments tend to occur chiefly toward the polar regions or in high southern mountain ranges. For this reason, many plants and animals typical of Canada occur in Virginia at Mount Rogers and other areas high enough to support Canadian climates.

Burkes Garden tops out at 4,700 feet on Beartown Mountain. Even the valley floor is 3,000 feet and higher. This is plenty of elevation to maintain the "northern" conditions required by cold-adapted organisms. Most of these used to be widespread in Virginia during glacial periods but are now isolated on high and cool islands along the Appalachians as the result of post-glacial warming. In addition to many kinds of both plants and animals that extend southward as far as the Great Smokies, such as red spruce and red squirrels, there are some which occur no farther south than Burkes Garden. A good example is a small and attractive ground beetle, *Bembidion graciliforme*.

Elevation and location interact to bring in a second category of residents. If one examines a map of the eastern United States that emphasizes elevation (*see illustration below*), it is easy to spot the concentrations of high (and cold) country extending down through central eastern West Virginia about as far as Bluefield, and another offset to the southeast, beginning at Mount Rogers and ending abruptly in north Georgia. This latter region corresponds to the Southern Blue Ridge, and contains over a thousand peaks above 4,000 feet. During previous geological times it has been both biologically continuous with, and climatically separated from, Canada. During the latter intervals it served as a refuge for glacier-displaced life, and many distinctive new endemic species originated there. Today many of these localized endemics enter Virginia only at Mount Rogers, but a number betray their former ranges towards the north by occurring at Burkes Garden, halfway between the two high country regions defined above. Several kinds of millipeds and ground beetles precisely represent this pattern of southern Appalachian endemics reaching their northernmost stand on Beartown Mountain, In 1947 my friend and I discovered the presence there of Jordan's salamander (*Plethodon jordani*)[2], its first known locality north of Mount Rogers.



(illustration by Ellen Compton-Gooding)

We have now recognized representatives of both northern and southern mountain species coexisting at one favored spot. But the biota is still more diversified by the presence of species whose ranges are more midwestern, centered on Kentucky and Ohio, and which barely enter Virginia along its western boundaries. A good example of such an organism is the green salamander (*Aneides aeneus*), an inhabitant of crevices in sandstone cliffs, for which Burkes Garden was for years the easternmost known locality (it was later found on Walker Mountain, a few miles further east). A less conspicuous member of this group of animals is a funnel-web spider, *Coras tennesseensis*, which enters Virginia through the coal country and comes to the end of its known range in the Garden.

A perhaps more locally significant category of interesting animal residents is those which live nowhere else. The limestone floor of the bowl is replete with springs, sinkholes, and caves, and the latter are notorious for harboring local endemic species. So far we know a cave beetle and cave millipede, which share a cave with the only known nursery colony of long-eared bats, which prefer to conduct family business at elevations above 3,000 feet in the central Appalachians. A single branch draining the east face of Beartown has produced two endemic species of stoneflies in recent years. In the wooded slopes surrounding the Garden occur several additional localized millipeds.

Talk of a supposedly new species of salamander that catalyzed years of search was mythical. When the first green salamander turned up at the Garden, I realized that, with adjustments, this was the "black salamander with a golden dorsal stripe" that my informant had seen but not collected. And that itself was very fortunate,

[2]Editor's note: Virginia populations are now referable to the Gray-cheeked Salamander (*Plethodon montanus*).

because the years of search for a fantasy produced a biological harvest far more valuable than just a salamander would have.

Still another category is not without biological interest: basically lowland species which for inexplicable reasons occur isolated at Burkes Garden. Two examples will represent this group. One is the mud salamander (*Pseudotriton montanus*). Despite its species name, this animal is dominantly lowland over most of its range, occurring in muddy springs and swamps near the coast. It does occur in far southwestern Virginia, usually below 1,000 feet, but also occurs fairly commonly in the Garden's springs, at by far the highest elevation known for the species. A species of blister beetle (*Nemognatha piezata*) is basically restricted to the southern United States, reaching its northernmost locality at Raleigh, North Carolina. Northernmost, that is, until several were captured at Burkes Garden, the only known locality higher than about 500 feet and totally out of the logical range. Even the chance that a single specimen might have been transported by wind currents is unlikely – hurricanes do not track so far northwest across the Appalachians, and the beetle itself seems a little too heavy to be carried any great distance.

Collectively all of the foregoing information makes a good case to back up my contention about the really unique composition of the Garden's biota. But the point must also be stated clearly: probably what we now know is only the tip of the iceberg.

Why? Because my own field work there, despite its half-century of duration has been only superficial: a day here, an evening there, and largely concentrated on just a few sites. It is intriguing to imagine the results of a long-term carefully organized, and intensive biological survey that sampled all of the different biotopes year-round. Perhaps the Virginia Museum of Natural History can someday conduct, or play a leading role in, such an exploration, which would constitute a major milestone in the course of natural history study in both Virginia and the southern Appalachians overall.

Northern species extending southward along the mountain; southern endemics at their northernmost point and western species at their easternmost; local forms occurring nowhere else; lowland species isolated at a high elevation: What a grand diversity of dissimilar organisms commingling at a place of unsurpassed natural scenic beauty! What riddles of geographic dispersal to unravel! Any wonder that to me fifty years have enhanced rather than dulled the charm and challenge of a singular locality (one outstanding in a singular state!) that ever invokes the next visit with the promise of something new and interesting?

Go and see it for yourself: that sceptered bowl, that mountain fortress that Nature has drawn up around herself, that other Eden, demiparadise, that Burkes Garden!

Richard L. Hoffman is Curator of Recent Invertebrates at VMNH in Martinsville.

Dr. Hoffman in his laboratory. Photo by Rick Boland.

Banisteria, Number 40, pages 90-91

Bug of the Month[1]

Richard L. Hoffman
Department of Recent Invertebrates

I never cease to be amazed, while preparing insects for the museum collections, by how many of our local species, even very small ones, had been named and described by European specialists as long ago as 1800. The early pioneer collectors did a remarkably thorough job of scouring every kind of habitat, and did it without such modern gimmicks as black light traps, soil extraction funnels, or pitfalls. As a result, it is now unusual to turn up undescribed species of beetles, for instance, in Virginia. But by a curious history of benign neglect, just the opposite can be said about millipeds, not just in Virginia but almost any part of the world except western Europe, which has been thoroughly picked over.

The current list of about 110 kinds of millipeds recorded for Virginia is matched closely by the number of species found here over the past few decades but still not scientifically named and described, and this number increases on an annual basis. Under such conditions, the thrill of discovery wanes and describing the accumulation becomes a chore. But occasionally, a capture is made that transcends the tedium of "another one to be named" because it sheds sudden light into a dark maze of hypothetical fabrications.

One such discovery was made several years ago during random collecting, and against all odds of statistical probability. A team from the museum's Department of Recent Invertebrates was looking for a suitable site along the North Fork Holston River near Gate City to install a pitfall collection unit. All of the preferred lowland terrain seemed to be cleared for pasture or cultivation, or was subject to flooding, so attention had to be shifted to wooded hillsides, none of which seemed really promising. Finally a site was selected by default although little hope was held for a successful outcome. And this pessimism was born out for the next several monthly visits: only a sparse selection of common local species was captured. But when the traps were cleared on the visit of November, 1998, somewhat different, small pallid millipeds were noticed among the usual debris. At first they were taken to be only immatures of some other form. Laboratory examination made that same night showed, to the contrary, they were adults, and moreover, members of a group of species (classified in the genus *Rhysodesmus*) previously known only from Mexico, Guatemala, and western Texas, in which area there are dozens of species. The excitement level became very high!

Of course the animals belonged to an undescribed species, which was written up and published with immoderate haste in the museum's journal "*Myriapodologica*".[2] How could such an enormous geographic dislocation be explained? Some years ago, on the basis of studies of some related groups strictly native to eastern United States (and largely to the Appalachian region), I postulated that the **ancestors** of today's living species of *Rhysodesmus* left the Appalachians and migrated westward at a time when deciduous forests were continuous across what is now the Great Plains. Upon reaching the Mexican highlands, these immigrants must have found rich country unoccupied by related, already established millipeds, and so colonized the entire region quickly and successfully, producing dozens of rhysodesmid species. Later, as climate changes replaced the earlier forests in southern United States with semiarid grasslands, the Mexican populations were effectively isolated from their Appalachian relatives.

The fortuitous discovery of the Virginia *Rhysodesmus* was significant in two respects: it confirmed the postulated Appalachian origin of the genus, and more importantly, showed that *Rhysodesmus* had already acquired its present characteristics **before** it started the long trek westward, leaving a few "stay-at-home" species that managed to survive in the ancestral homeland. For this reason, the new discovery in Washington County, Virginia, was given the scientific name *Rhysodesmus restans*. The species name means "one who stayed behind."

Consider the odds against the discovery ever being made. It is probable that the species now exists only in small isolated populations, fragmented by forest clearing. The decision to conduct a survey in that particular part of the state was made primarily to introduce a museum presence there, and the selection of the actual pitfall site was governed by totally negative factors. It was certainly not a place that I (or any other entomologist) would have chosen: a thinly wooded hillside recovering from some former clearing disturbance. Given a choice, most millipeds (as well as beetles, spiders, and other soil arthropods) prefer moist mature broadleaf forests, and that of course is where collectors look for them. The odds against the pitfalls being placed in a spot occupied by the *Rhysodesmus* were a million to one.

[1]Originally published (without footnotes) in the early to mid-2000s in *Research and Collection Notes*, an informal, in-house newsletter for staff of the Virginia Museum of Natural History. Reprinted with permission of the Virginia Museum of Natural History, Martinsville, VA.

But the story has a sequel. With respect to rare, or rarely collected animals, there is a saying that their capture is often like getting tightly-packed olives out of a bottle: once you get the first one, the rest come easy. Within a few months after the discovery of *restans*, a closely related second species was found by pitfall operations in a cultivated field at Knoxville, Tennessee. The collector sent his material to Dr. Rowland M. Shelley at the North Carolina Museum of Natural Sciences, who named this species, again in "*Myriapodologica*", as *Rhysodesmus agrestis* ("of the fields").[3]

What do we learn from this story? That there are probably a lot of similar instances, which cannot possibly be anticipated, scattered through the Appalachian biota, and that surely includes many more small, isolated *Rhysodesmus* species. That one cannot possibly select, by logic or previous experience, the place in which the discoveries will be made - everything will depend on serendipity. And that living millipeds have a lot to tell us about the conditions under which their remote ancestors (just like our own) existed, dispersed, and evolved.

[2]Hoffman, R. L. 1998. An Appalachian species of *Rhysodesmus* (Polydesmida: Xystodesmidae: Rhysodesmini). Myriapodologica 5: 77-83.

[3]Shelley, R. M. 1999. A second east-Nearctic species of *Rhysodesmus* Cook (Polydesmida: Xystodesmidae). Myriapodologica 6: 19-22.

Banisteria, Number 40, pages 91-92

Abolish Invertebrates!

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Some years ago, I was invited to address a meeting of wildlife management biologists on the status of invertebrate animals *vis-a-vis* the primary concerns of the conference. With a title like "The Trouble with Invertebrates" and the opportunity to launch a major evangelistic initiative, I took along a rather densely branched dead shrub about two feet in height. About four inches of one terminal twig was painted bright red.

After acknowledging my introduction, I commenced the presentation by brandishing the plant with the announcement: "Behold, the Animal Kingdom!" Allowing a brief pause for this to sink in, I then broke off the red twig and flung it onto the table beside the podium. **"That** was the phylum Chordata, in terms of overall numbers and diversity! Is **this** [a flourish of the shrub] the equivalent taxon?" The following 45 minutes were devoted to an examination, and emphatic denial, of that very question, and should have been the opening shot in a campaign that sought to establish a perception of animal groupings commensurate with their actual pragmatic status in the world. The road to Hell being paved with good intentions, the potential crusade promptly fell flat on its face owing to the intervention of a morass of routine responsibilities and distractions. But late is always better than never, and insofar as I can tell, attitudes and perceptions in the scientific community have changed not one iota since the night of my well-intended shot (which was not heard outside the confines of one conference room, much less around the world). Perhaps an attempt to address a larger and more diverse audience will find targets receptive to my appeal for the just treatment of about 90% of known animals.

In a review of arthropod classification as it stood in the mid-1890s, Orator Fuller Cook (1896: 49)[2] lamented the tendency of contemporary zoologists for "... describing together the indiscribably [sic] diverse." That succinct phrase could encapsulate nicely (magnified by a factor of ten) the elements of what I consider to be the real "trouble with invertebrates." Ironically, the problem started in 1801 when my own hero and role model, Jean-Baptiste Pierre Antoine de Monet, Chevalier de Lamarck[3], divided the then-known animal kingdom into two primary categories and introduced the term "Invertebres" for those members of the less popular and less studied of the two. At the time, such a dichotomy was not especially disproportionate, but unfortunately, to use modern terms, while the concept "Vertebres" was supported by a substantial apomorphy, its cognate group was not, and was defined by negative conditions only.

Of course, everybody is now aware that numerically at least, the tables have turned, and even primary school science texts observe that beetles alone far outnumber the vertebrates collectively. In fact, even the single beetle family Curculionidae accomplishes that feat, with over 50,000 known species and probably several times that number yet to be documented. The number of phyla of what would now be considered as multicellular animals without a spinal column currently runs about 28. A recent

[1]Deceased. Editor's note: This essay (without footnotes) was prepared by Dr. Hoffman in 2000. I believe that he considered submitting it to a national journal, but apparently never did so. The essay is published here for the first time.

classification of living organisms (Parker, 1982)[4] lists 85 classes of "invertebrates" against seven such taxa of Chordata/Vertebrata. The disparity inherent in this two-way division of animals has become generally understood, but the problems thus embodied are rarely addressed.

An extreme, if fairly insignificant example, may be found in the organization of the scientific staff at the small museum where I am employed. It was set up by the original administrator (an anthropologist with no concept of animal classification beyond the catarrhinine primates) with a curator for each of the four major vertebrate disciplines, and a fifth for "Invertebrates". Under such conditions, a person so disadvantaged would normally be able to keep up with the local fauna of perhaps one class, or even just one order. A division of labor more commensurate with actual numbers and diversity would reasonably dictate 50 curators of invertebrate taxa to enjoy the same work-load and capabilities expected of, may we say, a mammalogist. Larger national museums do recognize these realities, but even though nearly every one still employs mammalogists, ornithologists, herpetologists, and ichthyologists, none even attempt to encompass the remainder of animal life. In fact, taxon-specialization has now become common: museum A sends all its holdings in arthropod taxon A to museum B, and B transfers its material of taxon C to museum F, despite maintaining large staffs in the systematically well-studied vertebrate classes (how many times can a field be plowed?).

It has been many years since I qualified for an NSF grant, but in the pre-DNA era, when I was quite successful getting support for old-fashioned descriptive taxonomy, the National Science Foundation used to split its budget for animal taxonomy right down the middle: 50% for Vertebrates, 50% for Invertebrates. I hope this ratio has changed, but I am confident it has not reached the 1%: 99% that the actual situation requires. One of the worst side effects of administrative ignorance (well, unawareness) is the unrealistic expectation that the kind of research now in vogue for birds and mammals, involving the holy trinity of molecules, computers, and cladistics, is appropriate for groups in which maybe 25% of the extant fauna is so far known, and the limits of families and even orders are still in dispute. One result is discrimination - amounting to censorship - against the least-known (all invertebrate!) taxa, because the flashy modern approaches just don't work well on any group that has not already been worked out and classified by traditional methods. One downside of this partiality for redundantly restudying the already well-known, is that far more money is poured into fine-tuning vertebrate taxa ("Is taxon A a subspecies of taxon B, or a distinct sibling species?") than in getting a start made on huge taxa (in many non-vertebrate phyla) that have never been classified for the first time, but can be studied for a fraction of the cost of DNA analyses.

People who are conducting biological inventories are still, by and large, afflicted with the idea of "invertebrates" as a mammal-sized group. The misconception is fostered by the prevalence of university-level textbooks entitled "Invertebrate Zoology" or some permutation thereof. Even though such books often achieve majestic size, they can at best reflect the futility of attempting to describe, between two covers, the indescribably diverse, and in so trying, perpetuate the illusion of an invertebrate unity.

I think the time is long past due, that this indefensible, unscientific perception of a zoological taxon equivalent to "Vertebrata" be purged from any form of use, even in the "popular" contexts. The way to begin is to abolish the word "invertebrate" from the language. It is a meaningless word, it does not reflect any kind of objective reality, it is in fact denigrative in implying an inferior status ("in-" = without, lacking, less than), it is an oversimplification that does injustice to immense diversity and leads to inadequate recognition. Most zoologists are aware of these facts, but continue to preserve the old status quo, the meaningless dichotomy. Botanists do not oppose angiosperms to all other plants; geologists do not insist that the Quaternary is equivalent to all that preceded it. I realize that traditional mindset is difficult to correct, but it should be kept in mind that a deposed concept does not HAVE to be replaced if it was inadequate or incorrect to begin with. I therefore do NOT suggest an alternative name to "Invertebrates", when the proposed correction requires no name at all.

Surely Lamarck himself would deplore the excesses imposed on his originally useful taxon, and might gladly lead a worldwide movement to propose in its stead a more precise frame of reference for the multitudes of taxa for so long mutilated on the Procrustean Bed "Invertebrates". In his absence, and in respect to his contribution, I venture to suggest a call to arms: "*Écrasé le nom Invertebrés*!"

[2]Cook, O. F. 1896. The larvae of *Stemmatoiulus*. Brandtia [A Series of Occasional Papers on Diplopoda and Other Arthropoda] 11: 47-50.

[3]Lamarck, J.-B. 1801. Système des animaux sans vertèbres. Paris.

[4]Parker, S. P. (ed.). 1982. Synopsis and Classification of Living Organisms. 2 volumes. McGraw-Hill, New York.

The Alleghany Naturalist[1]

Richard L. Hoffman
Clifton Forge, Virginia

Banisteria, Number 40, pages 93-108

THE TIMBER RATTLESNAKE AND THE NORTHERN COPPERHEAD

Richard L. Hoffman and Lawrence M. Carter
June 23, 1944, *The Daily Review*

Because of their poisonous defensive mechanism and the possible danger of being bitten and seriously injured by one of them, we have decided it best to devote the first installment of this series to a discussion of the color and distinguishing features, their habitats and general habits, and how they may best be avoided.

The first question that most people ask about any snake is whether or not it is poisonous. Of the 20-some species of snake that live in our vicinity, only the two mentioned above are poisonous. The Water Moccasin, or Cottonmouth, with which the local Common Water Snake is often confused, is found only in the very southeastern part of this state, in the Dismal Swamp. The fact that our local water snakes have white mouth-linings does not mean that they are Cottonmouths, for many snakes have the mouth linings very white. In describing these snakes, it will be necessary to deal with each separately, but there are some common characteristics that may be taken into consideration here.

Both snakes belong to the family of Pit Vipers. The name is derived from a peculiar nose-like sense organ, which is located between the eye and opening of the nostril. The bodies of both are proportionately heavy, the neck is rather narrow, and the head is flat and triangular, due partly to the presence of the poison glands. The pupil of the eye is elliptical, like a cat's; this adaptation is due to the fact that both snakes prefer to remain hidden during the day and hunt for food at night. When observed during the day the pupil of the snake's eye will be a mere tiny vertical slit, often difficult to detect.

The poison apparatus consists of: - a pair of fangs, hinged in the front of the upper jaw; two poison sacs, one behind each eye; and ducts connecting the venom sacs and the fangs. When not in use, the rather long fangs fold back along the roof of the mouth, and are covered by a sheath of skin. When the mouth opens, the arrangement of head bones automatically erects the fangs into proper position. The fangs are hollow, and in case they are broken off, they are replaced by new ones which form just behind the functioning fangs.

The most widely known and feared snake in the United States is the Rattlesnake. The species which is found in the entire eastern part of the country and is found locally is the Timber or Banded Rattlesnake. The usual coloration is a yellowish-brown, with wavy dark brown or black crossbands edged with yellow. The color toward the tail may be black. Another color phase occurs here, but not so often as the one just mentioned. This form is almost entirely black. In some cases bands may be discerned, these at the middle of the body. As a general rule, the yellowish phase is female, the black, male.

The chief habitat of this snake is rocky ledges of mountains where they hibernate during the winter months, and though the snakes venture down into the valleys and cultivated areas in search of mice and water, they always return to the same den in the fall to hibernate.

The Timber Rattlesnake, because of its size, is a very dangerous snake and is likely to be encountered almost anywhere that small rodents abound, i.e., huckleberry bushes. However, by consuming destructive rodents, it serves some useful purpose.

Contrary to popular belief, the age of a rattlesnake cannot be told by the number of its rattles. A rattler is born with a "button" and adds one rattle each time the skin is shed, which is about three times a year. It is not uncommon to find a very large rattlesnake with only 3 or 4 rattles, since they are apt to break off from time to time.

The Northern Copperhead's coloration is a pale brown to a light reddish brown, with about fifteen chestnut-brown crossbands shaped like hourglasses. The top of the head is copper colored and without markings, often being of a lighter hue than the body. This snake is commonly confused with the Water Snake, Milk Snake, Corn Snake, and Hog-nosed Snake, better known locally as 'Spear-head.' It differs from these as follows: the Water Snakes do not have a triangular head or hour-glass shaped bands; the Milk and Corn Snakes are not banded, their heads are small and marked, and their bellies are well-marked with black; the Hog-nosed snake does have a resemblance to the Copperhead, but does have a coppery head, and the belly differs in being blackish.

The Copperhead receives more attention because it is the most common poisonous snake of North America and has a wide range of wandering. There is no certain preference of habitat, for it seems to be found in a variety of places. It is common along the tops of rocky mountains, in pastures and other low fields, along river banks, and even has been found in stonework inside the city limits of town!

There are numerous records of bites by Copperheads but few fatalities have resulted. This can be attributed to the fact that it is a relatively small snake and its fangs are proportionately shorter than those of the Timber Rattlesnake. It seems to be a sluggish snake and does not attempt to escape when approached, and our observations have shown that it does not make any attempt to strike unless stepped upon or annoyed. Most cases of Copperhead bites have resulted from this condition and the fact that the victim was wearing low shoes. If a Copperhead feels that it is to be molested, it will vibrate the tail rapidly, and if the snake is in dried leaves, this produces a readily heard buzz.

The easiest ways to avoid being snake bitten while camping or

[1]Editor's note: The 27 weekly nature columns reprinted here comprised a series entitled "Do You Know?" written by Richard L. Hoffman (his friend Lawrence M. Carter coauthored the first three; see photo page 31) in the months following his graduation from Clifton Forge High School at the age of 16. The columns were published every Friday during the latter half of 1944 in *The Daily Review*, which had the smallest circulation of any daily newspaper in Virginia at that time. Richard originally proposed that the column be entitled "The Alleghany Naturalist" (as done here), but he bowed to the wishes of a newspaper staff member who suggested the alternate title. Many of the columns were composed the night before they were published, requiring Richard to slip his text under the newspaper's door so that it could be typeset early in the morning. The columns covered a variety of subjects, with nearly half of them focused on local amphibians and reptiles. Richard also wrote about mammals, insects, spiders, harvestmen, millipeds, centipeds, and crayfish. The columns clearly conveyed his passion for natural history and his already well-developed breadth of knowledge (at a time when there were few libraries, no computers or internet, and many animals were poorly known compared to today), as well as his talent for writing. Richard's penultimate column was published on December 15, 1944, nearly five years before the appearance of Aldo Leopold's classic conservation book *A Sand County Almanac*. That column, entitled "A Statement to All Who Have an Interest in the Conservation of America's Natural Resources," served as a precursor to Richard's lifelong commitment to the conservation of biological diversity, especially in his native state of Virginia. He stopped writing the column two weeks later, reportedly due to a combination of boredom and the desire to pursue greater challenges such as describing new species. The columns show a clear progression from basic natural history writing in the early ones to more sophisticated, conservation-oriented messages in the last few installments. All of the columns reveal Richard's strong desire to educate the general public and convince them to be more appreciative of the natural world in the Clifton Forge area, and in the process, to discard myths, old wives' tales, and other false perceptions.

I would like to thank the staff of the Library of Virginia for their assistance in locating microfiche copies of *The Daily Review* and the publisher of *The Virginian Review* for permission to reprint these columns.

hiking in the woods are: when walking in brush it is advisable to wear high topped shoes or boots, for many bites are inflicted around the ankles; do not put the hands into any low brush such as huckleberry bushes, or into any place which may harbor snakes, such as flat rocks or fallen logs; do not walk about at night without protecting the feet and legs as mentioned above.

The food of the Copperhead is varied, consisting of many kinds of insects, caterpillars, locusts, frogs, mice and other small vertebrates. The diet of this snake is of some value, because of the destructive rodents and insects eaten.

FIRST AID FOR SNAKE BITES[2]

1. Remain calm, remember that death from snake bite in the United States is comparatively rare.
2. Tie tourniquet between bitten area and heart.
3. Make two short deep incisions across each fang puncture and suck incisions provided there are no cuts or sores in mouth.
4. Secure medical aid, move slowly if alone.

Next week if none of our readers suggests a more preferred topic, we will discuss the sadly misunderstood Water Snake. Perhaps the sportsmen of Clifton Forge will find this article very interesting. In fact possibly interesting enough to bring about some effort by the fisherman to support their views on the subject.

SOME LOCAL SNAKE STORIES DISCREDITED

Richard L. Hoffman and Lawrence M. Carter
June 30, 1944, *The Daily Review*

Due to the fact that so many erroneous stories and superstitions concerning snakes are widely believed, and because we have received some requests for explanations of these, we have decided to withhold the article on water snakes which was originally scheduled for this time until a later date, and take up some of the more common and well-known snake stories which we have heard locally. Of course it is not possible to cover all of the many false stories and beliefs about snakes, and so in case any reader has a story which is not included here and would like it explained we would be most happy to discuss it in this column, or through a letter to the sender.

1. Snakes do not sting, nor bite in any way with their tongues. The tongue is used for hearing, as they pick up vibrations in the air with it.

2. No snake has any kind of stinger in its tail. Many kinds have a rather sharp scale on the top of the tail, but this is in no way a real sting such as bees have.

3. Snakes do not swallow their young when threatened by danger.

4. Snakes cannot chase anyone, or even stand, on the end of the tail. Neither can they kill trees by sticking the tail into them.

5. There is no such thing as Hoop Snake. It is anatomically impossible for a snake to roll like a hoop.

6. The Milk Snake, despite its name, absolutely does not suck milk from cows.

7. Rattlesnakes and copperheads cannot 'spit' their poison from a distance in the manner of certain cobras. Poisonous snakes are able to strike from a coiled position for a distance equal to one-third their length. They are able, incidentally, to strike for a short distance without being in a coiled position.

8. There is no snake which can injure or kill a person by whipping him with its body. Several local references to being 'thropped to death' by blacksnakes are entirely at fault.

9. The belief that snakes will not die until sundown is incorrect. The fact is that the snake's nervous system will continue to move the mauled.

10. Snakes cannot hypnotize birds, or anything else, for that matter. In most cases of 'snake charming bird' the actions of the bird are merely to lead the snake away from a nearby bird nest. Apparently people believe that snakes can charm things because of their rather fixed, glassy stare. If humans had no eyelids we would probably look the same way.

Due to the fact that our space is limited we have not been able to explain any of these stories in this column. We understand that many readers may want more information of these or other stories they know; and in such cases we will be glad to answer any letters sent in by readers in this column, or will answer any question which the sender prefers not to be printed upon his inclusion of a stamped envelope. Of course, we will attempt to answer any question put to us personally.

Questions and Answers

In a recent argument with some of my friends the question of whether or not we have Coral Snakes in Virginia came up. I hold that those snakes are not found in our state. Can you set us straight on this subject? D.F.G., Clifton Forge.

Answer. You are correct in claiming that Coral Snakes are not found in Virginia. The species does not range farther north along the Atlantic coastal than southeastern North Carolina, and there is little chance that it will ever be found as far north as southeastern Virginia.

So far we have very little criticism and few suggestions concerning our subject matter. We hope that someone will make a suggestion concerning next week's article, but if none come in, the subject will be one of our own choice. Suggestions should be in the Review office by Wednesday.

AN EXAMPLE OF MISDIRECTED ABUSE

Richard L. Hoffman and Lawrence M. Carter
July 7, 1944, *The Daily Review*

Our common Water Snake is certainly a much-maligned creature, not only locally, but in almost every part of its range. This reptile is rather unfortunate in being mistaken for the poisonous Water Moccasin; and while this is bad enough, there is yet another stream of abuse coming from fishermen, and it is this latter dislike that causes a rather high mortality rate in the snake population. It seems that sportsmen generally have an aversion to the Water Snake on the grounds of the havoc it supposedly wreaks on the nation's vital trout supply.

The first excuse for killing the Water Snake, as mentioned above, is that it is one and the same as the Water Moccasin or 'Cottonmouth.' If such were true the reason would be a very good one indeed. But as the true and poisonous Moccasin is found no farther north in Virginia than the vicinity of Norfolk, and then only sparingly, the energy expended in killing water snakes locally is wasted and no practical ends are served. Our water snakes have no more poison apparatus than do English sparrows.

The men who fish for trout as a means of recreation do not favor anything happening to the fish supply. When it became known, long ago, that water snakes ate trout, sportsmen decided to do themselves and the fish a favor by killing any and all water snakes so unfortunate as to show themselves. Occasionally the anti-snake movement broke out into campaigns with bounties offered for heads, but as far as can be determined very little decrease in the snake population resulted.

In 1936 and 1937 the United States Biological Survey made a study of the food habits of the snakes of the George Washington National Forest. Results in regard to the water snake were interesting. Game fishes formed only 13 per cent of the total diet, and only 6 per cent were trout. Thirty-two per cent of the total diet was composed of predacious fish called "miller's thumbs," and in regard to them we would like to quote from the report on the study (Food of Snakes of the George Washington National Forest, by F. M. Uhler, C. Cottam, and T. E. Clarke; Trans. 4th North Amer. Wildlife Conf.) "Because

[2] *Editor's note*: Steps 2 and 3 are no longer recommended by medical experts for the treatment of venomous snake bites.

these fishes are notorious spawn eaters, their destruction by the snakes is a point in the latter's favor and compensates in part for its predation on valuable fishes." Some herpetologists state that a good part of the game fish eaten by water snakes are diseased or dead, and that the snakes thus perform a service in preventing infection of other fish.

Of course there are some who will probably say "All the above may be true, but if they ate just one trout that would be too many." In answer to this we suggest that those persons begin a campaign to exterminate all the kingfisher population, as those birds are almost certain to catch trout occasionally. That may sound impractical, but it would not be impractical to do something about the type of "sportsmen" we know who aren't at all past throwing undersized trout onto the bank instead of back into the creek. Several persons who prefer to remain anonymous have told us of this, and we have seen quite a number of dead fish on the banks of Smith Creek during trout season.

Mr. T. E. Clarke, who, as Director of the Virginia Game and Inland Fisheries Commission, is certainly in a position to understand and authoritatively comment upon the snake-trout situation, has written us concerning the theoretical depredations that snakes make upon fish. We take pleasure in quoting several passages directly from his letter.

"During the six years I have worked with the snakes of the George Washington National Forest, there was little evidence that the snake itself could ever be considered a factor as a drain on the fish of the mountain streams.

"You must recognize there is an element that, when learning that the snake would kill a fish, is only too ready to insist that the entire snake populations be wiped out. This same group fails to realize that these snakes do a great deal of good, and frankly, it is useless to argue with them..."

Mr. Clarke mentioned that recurrent dry spells and sinking of streams in the summer killed at least ten times as many trout as did water snakes. It seems, that if there is any scarcity of trout locally that the local organizations concerned with such matters might devote their efforts to preventing wanton and spiteful killing of young fish such as mentioned above, and to improving the creek with check dams, artificial pools, and other methods. Sportsmen should realize that all forms of wild life are inter-dependent upon each other, and if this balance is interrupted by the extermination of one population the rest are usually affected.

Questions and Answers

Lack of space prevents our printing a most interesting letter sent in by a reader who made some comments on the column and concluded with a question on the food habits of the ruffed grouse.

Answer. Adult grouse do not utilize insect food to any great extent. The following have been reported: grasshoppers, crickets, bugs, flies, beetles, moths, spiders, centipedes and earthworms. The usual percentage of insect food is about 0.07 or 0.08.

"LIZARDS--WET AND DRY"

Richard L. Hoffman
July 14, 1944, *The Daily Review*

(Author's note. It was with extreme regret that I experienced the departure of my friend and colleague, Mr. Lawrence M. Carter, who has collaborated with me on the last three installments, and who has entered the Army Specialized Training Program. It is my hope that he will, however, find time to send an occasional article for publication in Do You Know?)

The time has come, says my better judgment, to change from snakes and talk of other things. Hence, as suggested by the title of this installment, I have chosen the next best (or worst) subject, the snake's first cousins.

While it is generally known that there is a difference between spring lizards and dry-land lizards very few people know that there is as much difference, anatomically, as there is between humans and ostriches. So with the object of bringing about proper distinction between two commonly confused groups the following discussion is hopefully launched.

The chief common differences between spring lizards, better called salamanders, and land lizards, which really are lizards, are that the former are really found in wet or damp places and are used for fish bait while the latter are usually found in dry places and are seldom used in fishing. While these differences are really good ones here are a few more ways to tell them apart: salamanders have a smooth, thin skin, and do not have any kind of claws; while lizards have their bodies covered with scales and all have sharp claws on their toes.

Salamanders are amphibians, which are actually not as highly developed as reptiles. They hatch from eggs laid in water or damp places, and for some time after hatching the young have external gills like tadpoles. Usually they lose these, though sometimes full grown salamanders may be found sporting a pair of gills. In Alleghany county we have about eight kinds, or species, while about four more may be found later. The most common kinds are the Dusky and Seal Salamanders, which are found in water or damp places and are used for fish bait. They are usually some dark color such as brown, dark grey or blackish. The Seal Salamander differs from its relative by having an unmottled belly. Other common kinds are: the Red Salamander, which is red with black spots; the Two-lined Salamander, which is always found in water and is yellow or orange with two dark lines down each side of the back; the Long-tailed Salamander, which is yellow with black dots; the Red-spotted Newt, which is found in water and is greenish or olive with several small red spots on the back; and the Slimy Salamander, which gets to be about eight or ten inches long and exudes slime from its pores when handled.

Lizards are reptiles, and so closely related to snakes that the only real difference, technically, is in the structure of the skull. And not all lizards have legs; some tropical species have none at all, nor do they have eyes or ears either. Lizards hatch from eggs laid in dry places, usually, and the little fellows look just like Maw and Paw, no gills, if you please. There are eight species in Virginia, we have six around Clifton Forge, and none are the least bit poisonous. Our six kinds of lizards divide into three groups, Race-runners, Pine Lizards and Skinks.

Race-runners may be found in some numbers in Roxbury Hollow, elsewhere they are rather scarce. If one is lucky enough to see a race-runner not in motion he may discern six yellow lines and one brown one on the back, which is usually some shade of dark brown.

The Skinks, and we have four rather similar species, usually have a striped pattern and a blue tail when young. The Brown-backed Skink is a very rare and secretive little lizard that looks and acts a good deal like a salamander, and does not have stripes or a blue tail. The Black-banded Skink has only four light lines, and is somewhat rare here. The Five-lined Skinks (there are two, separated by scale row counts and postlabials) both have five yellow stripes on their dark bodies and have blue tails when young, but one kind grows to a length of about 12 inches, and these old specimens are usually brown or tan with the head some shade of red. The latter form is believed by many to be poisonous, but of course it isn't, although it will bite if seized.

The Pine Lizard is very common, and is well known as a little brown or grey lizard commonly seen on rail fences or trees. It eats insects like all our other lizards, and like the rest, it will detach its tail if grabbed by that part. But most lizards don't really mind that, and go about their business growing a new one. Incidentally, in connection with this species, the ones seen wearing bright patches of color such as blue or green on their throats are male lizards. The females never have any decoration, for Nature rarely bestows such attractions on the

females of lower animals.

Next week, if nothing exceptional intervenes, I would like to call the attention of this column's readers to a most interesting species of creature which is really outstanding in its group. While I am not really certain that this creature occurs in our streams it very probably does, although sparingly.

TERRAPINS, SKILPOTS, AND RIVER TURTLES

Richard L. Hoffman
July 21, 1944, *The Daily Review*

(I sincerely regret that certain conditions have made it advisable to postpone the article previously planned for this installment until a later date, and I hope that the following article will satisfactorily take its place.)

By such names as those above are our local species of turtle known. Since there are only about a half dozen kinds found here the matter of identifying them with more or less proper names should be simple. I personally don't have anything against common names. Most of the time it is easier to say "Skilpot" than Painted Turtle, and if that rather quaint name was restricted entirely to that species I wouldn't have any complaint, so to speak. But there is duplication, for I have heard the name Skilpot applied to at least three local species of turtle. Hence, in campaigning for "one name for each turtle" I hope the following discussion will result in standardized nomenclature.

A turtle is a reptile. But that doesn't mean that it's just a lizard or snake in a shell. It is much more primitive than are snakes, for there were turtles crawling around in the Mesozoic or some later Era. Long before snakes developed from some lizard-like critter. Turtles don't have much in common with snakes in that their headbones are solid and fixed, they have legs, and all have a shell made up of extensions of the vertebra. And one other thing, all our species lay hard shelled eggs, while snakes lay soft eggs.

1. The Snapping Turtle. This form is variously known as Mud Turtle, River Turtle and Skilpot. No one can mistake this species, with its large, blunt head and long tail. The shell is very rough and flat, and what shell there is underneath isn't much help in protection. The usual color is dark gray or brown. They are found in both the Cowpasture and Jackson rivers, and the chemicals in the latter don't bother them a bit. One final note, some people eat these turtles. This is entirely a matter of opinion.

2. The Musk Turtle. This little fellow is not as common as most of our species. It is small, the shell rarely exceeding six inches, and is usually solid gray. The shell is smooth and rather dome-like, and the shell protecting the belly, called the plastron, is quite small. A good feature of this form for identification is the pair of yellow lines on each side of the head. I have known this form to be called Mud Turtle and Skilpot. Let's call it Musk Turtle from now on.

3. The Painted Turtle. Which form is usually known as Skilpot and nothing else. They are found all along the Cowpasture river and are well known to fishermen. For the benefit of those who have not seen them, they have a rather flat, smooth shell, generally black or slate gray, with many little red marks around the edge. Underneath they are generally some shade of yellow. The head is spotted with yellow or orange. And incidentally, to avoid confusion with the small hand-painted turtles sold as curiosities, the form under discussion now is just "made that way" and is naturally colorful without the influence of man. I don't believe that Painted Turtles are found in the Jackson river below Covington, or else are extremely rare. In fact, they appear to be rare or missing even above Covington. If anyone has seen this species anywhere in the Jackson river I would appreciate his telling me.

4. The Spotted Turtle. This seems to be the scarcest form we have locally. I have seen it only in the Cowpasture river in Bath county, at Fort Lewis, to be exact. It may, of course, occur in other places, but I just haven't seen it elsewhere. This species, is medium sized, the shell getting about nine to 12 inches long. The back and limbs are black or almost black, and the shell and head are well marked with many scattered small yellow spots. These spots are arranged in no definite pattern.

5. The Box Turtle. Our most common form is usually called just by the name Terrapin. I haven't heard this nickname applied to any other species. And everyone, I'm sure, has seen this form, or knows what it looks like. It is sufficient to say that they live on land and shut up in front when disturbed. In fact, when they close the hinged lower shell in front they are usually safe from about anything except "nature lovers" with large rocks, automobiles, and forest fires. Occasionally one can find a skeleton of the shell in the woods, but it is peculiar that very seldom can the lower part of the shell be found. An interesting fact concerning this form is a method of determining the sex of Box Turtles. If a specimen has a definite little hollow or concavity in the middle of the lower shell that turtle is a male. Males usually have red eyes, also, while the lower shell of the female is flat and her eyes are brown. This rule applies only to Box Turtles, and will not work on other species.

The subject to be discussed next week is rather indefinite. If certain factors are favorable it will be the one originally scheduled for today. If not, the next article will deal with "Mice, Moles, and Shrews."

THE HELLBENDER, A SALAMANDER OF EXAGGERATED PROPORTIONS

Richard L. Hoffman
July 28, 1944, *The Daily Review*

After some time I have gathered enough information on this creature to warrant an article on it. I have no personal knowledge of it in our region, but the probability of its being found here makes the following article pertinent. It is highly possible that the creature has been seen, but the fact has not come to my attention. All my inquiries in Alleghany and Bath counties have had negative results. In case anyone has seen the present species, or believes he has, I would appreciate his calling my attention to the fact.

The Hellbender is unique. No other amphibian is quite like it. It is really a salamander, and closely related to our common forms usually called 'spring lizard,' but differs from these chiefly in the great size. The female is usually a bit larger than the male, but the average adult length is about 22 or 24 inches. This is big for a salamander and the body is quite stout in proportion to the length. Unlike most amphibians, the skin of this species is not smooth, but is coarse and very wrinkled, especially along the sides. The tail is rather short and is flattened vertically. The feet are webbed and small.

If this creature does occur here, the best reason that it has not been seen is its nocturnal habits. During the day it usually hides under river banks and under debris in the water. At night it comes out of hiding and prowls about the river bed looking for something to eat. It is very probable that lines such as are sometimes set for catfish might catch several Hellbenders if left overnight, and the Cowpasture river might be the best place to put out the line. When taken alive the creature is difficult to handle, for its disposition is bad indeed, and the large size would make its bite unpleasant.

Hellbenders are not very highly developed animals and are very hard to kill. Perhaps the most amazing incident relative to their toughness is commented upon at length by Hornaday in his book, American Natural History. He describes a time when he collected a Hellbender which he attempted to kill by knocking it on the head and leaving it out of water all day. After this he immersed it in grain alcohol for 12 hours, which should have preserved and hardened it. But when he removed it for study, he found it not only alive, but, as he put it, "with a perfect jag on." Anything that can live in grain alcohol for 12 hours is really tough. Of course, it could be quickly killed by decapitation or by injecting alcohol into the heart or brain.

I have chosen to discuss this form because of the strong probability that it may occur here. There is a museum specimen from

the New river in Floyd county, and at one point in Craig county the headwaters of Craig creek, which flows into the James, are but a very short distance from those of a tributary of the New river. It is likely that the Hellbender could cross the intervening area for at least one other species of salamander has been found to have done just that and crossed from the New river drainage into the James system. Craig creek, especially near its mouth, would be a likely place to find the hellbender. Another possible avenue of distribution is provided by the close proximity of the headwaters of the Jackson and Cowpasture rivers and those of the Potomac river in Highland county. The divide near Monterey is very flat and indistinct and the creatures could readily travel across it. The Craig creek valley, however, provides the more likely place.

With reference to the peculiar name, I have no idea concerning its derivation. It does seem to fit the creature nicely, however.

HOG-NOSE SNAKE

Richard L. Hoffman
August 4, 1944, *The Daily Review*

Tonight this column will deal with possibly the best, and worst known snake that occurs locally. It has a multiplicity of names besides the proper name given above, and the following list makes no claim for completeness. I have heard, in Clifton Forge alone, these singular and descriptive handles: Spread-head, Spread-head Moccasin, Moccasin, Dry-land Moccasin, Puff Adder, Blowing Adder, Spread-head Adder, Blowing Viper, and to get back to the beginning, Spread-head Viper. One will discern that the majority of these fiendish sounding titles apply to the creature's defensive habits, which are to flatten the head and neck and exhale in a loud hiss. Most of them are quite appropriate, but actually the Hog-nose Snake is the best tempered and most gentle snake in our locality.

Despite its harmlessness, this snake is as widely feared by some as the Copperhead. Incidentally, the Hog-nose is our only kind which resembles the Copperhead, and because of this unfortunate resemblance, the Hog-nose is widely killed in mistake. Many people who have no animosity toward snakes in general, will kill this form, thinking they have a Copperhead.

The defensive behavior is unique among snakes. Almost everyone knows that the species will flatten the head and body and exhale loudly when approached, and many will strike viciously. Right here everyone decides it's time to kill such a vicious snake. But it would be interesting to hold back the killing impulse a bit and see what happens next. In the great majority of cases the following procedure is followed. If the head flattening, blowing, and striking do not frighten the tormentor away, the snake will usually attempt to escape. If deterred from this the next step is for it to put on a very reasonable facsimile of a convulsion, complete with squirming, twisting in the dirt, and twitching; which usually ends with the creature on its back, quite limp, with the mouth open. This stage is the equivalent of the well known 'possum's trick of feigning death and when the Hog-nose snake is this way it can usually be handled in any fashion without its showing any sign of life. But here instinct betrays the poor reptile to man's crafty intellect. Turn the snake upon its belly, whereupon it will flop over on its back again. Nature must have decided that the only way for a dead snake to be is on its back! If left alone for a while the snake will turn over and scurry away as fast as possible. That is the usual procedure. In some cases the snake will not even try to bluff the aggressor or play dead, but will allow itself to be picked up without resistance. In either case, none have ever been known to bite. In view of its gentle habits there is no ground for killing such a snake, except for its resemblance to the Copperhead, and the differences between them will be mentioned now.

First in color. Hog-nose snakes come in three patterns and assorted sizes. The most common pattern is composed of a series of squarish spots down the middle of the back. They are varied colors, usually black, brown, reddish, or tan. They are always darker than the ground color, and there is a row of smaller square spots alternating with the central row on each side. The second color phase is very rare. Such specimens are solid dark grey or black. And as Copperheads never come in black phases, there should be no confusion in that case. The third pattern is rather similar to the Copperheads. It is made up of a number of dark bands all the way across the back and sides. But in this phase, as in the rest, the top of the head is marked with black; and besides, the color is usually dark gray or slate colored, with none of the light tan and reddish brown of the Copperhead. A good way to distinguish dead specimens is to look at the belly. In the Copperhead it is brownish-pink, with two rows of round pale brown spots, one on each side. In the Hog-nose it is usually blackish, without any spots,

There is also a difference in the defense behavior. Because of the highly variable disposition of the Copperhead there may be some who will discredit this paragraph, but it is good for the majority of cases. The Hog-nose's behavior has already been discussed. The Copperhead flattens the body but not the neck or head. The Hog-nose flattens the head and an inch or two of neck. The Copperhead does not blow loudly as does the Hog-nose snake. Incidentally, if one is close enough to a Copperhead he may discern a very peculiar musky odor. This scent is typical of almost all American poisonous snakes, especially when they are disturbed.

To end with, our common Hog-nose snake is quite harmless. It does not bite, nor enter houses, nor hypnotize anything, nor eat trout. The chief item in food is toads, varied occasionally by frogs and mice. A little observation is all that's needed to distinguish between it and the Copperhead.

FROGS AND TOADS

Richard L. Hoffman
August 11, 1944, *The Daily Review*

To most people there are but a few kinds of frogs and toads; these are known by many facetious names such as 'Hop-toad,' etc. Actually there is a greater number of such creatures than one might think. In the vicinity of Clifton Forge there are about a dozen kinds, and these divide up into the following groups: toads, tree-frogs, and true frogs.

Almost everyone knows that frogs and their relatives are hatched from eggs laid in the water and spend a period of time in the water as a tadpole. The change from egg to tadpole to frog is quite interesting, but there is not enough space in the present column to mention it. It might be interesting to note that frogs and tree-frogs lay their eggs in bunches, while toads lay their eggs in long slender strings.

While everyone knows what a toad is, very few, if any, know that we actually have two kinds of toads. These are the American Toad and Fowler's Toad, and the ways to tell them apart are many and of dubious value. A fairly constant feature is the nature of the spots on the back. If most of the black spots have only one wart apiece, the specimen is probably the American Toad. In the event of more than one wart to each spot, it is Fowler's Toad. Almost all anurans, as frogs and toads are collectively called, have a distinctive kind of call. Our toads sound very much alike, and make a kind of long high-pitched "whir-r-r-r." While they are usually more active in the spring one can hear toads calling at night all summer, usually just before or after rain. They are actually found in water at night, and it is often possible to hear them in Dry Creek along Race street.

Like other amphibians and reptiles toads shed their skins periodically. For the benefit of those readers who wonder why they never saw a shed toad skin, let it suffice that the creature eats its cast-off skin. The usual nature of food, however, is insects, larva, etc. While they are usually disregarded or killed here, their value has long been recognized in Europe, where it is customary to buy toads at the price of five cents each, to put in gardens. They have no trouble in eating their own weight in insects in a short time.

Tree-frogs are many and diverse, and are sub-divided into a number of groups, such as chorus and cricket frogs. We have about four kinds here, and possibly the most common is the "Spring-

peeper." This is a small gray creature which has a cross-shaped mark on the back, and it is very common in April and May in the vicinity of water. The call suggested the name, for it is merely a pair of chirps like "peep.....peep." The pause between the peeps is important, for some others have a similar call without the pause.

The Cricket Frog is the first to begin calling in the spring, starting in some cases as early as February. The first I heard this year were calling on March 17, at Douthat Park, and where rains had made pools in the large fields in the lower end of the Park the great number of frogs calling caused discomfort to the ears of anyone near-by. The call is just like a cricket's, only much louder. This form is usually some shade of dark gray with three parallel lines down the back. It can change the color from dark to light gray.

The Chorus Frog is a very small creature. Its adult size is seldom over an inch. The color is usually gray or light brown with a green stripe down the middle of the back. This form is quite common in Douthat Park in the spring, but I have only sound records of its occurrence at Clifton Forge. The call is "peep-peep" repeated many times without benefit of the pause between peeps. It usually begins calling about the first of April and stops about the middle of May.

The Tree-frog or Tree-toad is quite different from the rest of the group. It may be told at once by the rather rough skin of the back and by the adhesive pads on the toes. Usually this form does not begin calling until about the middle or last of April, and continues on and off all summer. About this time they are to be found in trees, and rarely call except when the weather is damp or when rain is falling. Most of the other tree-frogs call only during their mating season, and then only the males call, but the Tree-frog goes right on, as I said before, all summer.

The calling seems to be largely seasonal. Generally the Cricket Frog and Chorus Frog begin calling about the same time, from the first of February to the first of April, depending upon the weather. They have mostly stopped by the middle of April, and the Spring Peeper takes up where they left off and carries on until about the last of May. The Tree-frog has started by the middle of May and finishes out the summer alone. There is surprisingly little overlap in these periods.

Due to the fact that the Tree-frogs have taken more space than I intended to allot them, I shall have to conclude this article on frogs next week by taking up the various common water-dwelling frogs.

FROGS

Richard L. Hoffman
August 18, 1944, *The Daily Review*

This installment is the concluding number of a pair of articles dealing with the frogs and toads of the vicinity of Clifton Forge. In the preceding issue, the two toads and four tree-frogs were taken up. In this column the topics considered will be the four or five frogs common to this region. Frogs differ from toads in many respects. The best way to tell them apart is, of course, the dry warty skin of the toads as opposed to the smooth moist frog epidermis. Frogs, such as the forms to be mentioned later, are much more aquatic than toads, although the latter are sometimes found in or near water (usually because they are there to lay their eggs). I mentioned last week how to tell the difference between frog and toad eggs, but unfortunately there are few ways to identify the tadpoles. In most cases, however, toad tadpoles seldom get over an inch and a half, counting tails, while those of frogs, especially bullfrogs, often get about three inches long.

We have at least four kinds of true frogs in this area, and at least one more is likely to be found here. These will be discussed at this time.

Possibly the most common form is the Green Frog, which derives its name from the color of the head and back of adult specimens. In juveniles the color is uniformly gray or olive on the back, with the ventral color white. This form is commonly found along small slow, moving creeks and ponds, very rarely near rivers or lakes such as Douthat lake. There may be some readers who will, from the above description, confuse this form with the Bullfrog, but the differences in the two are distinct.

The Bullfrog is another very common form, and is well known to most people. This big frog is nearly always found in the vicinity of large bodies of water. It is similar to the Green Frog, but differs in not having any folds of skin down each side of the back as does the Green Frog. The Bullfrog also gets to be much larger, getting to be as much as seven inches long in body length. The Green Frog rarely gets over three and one-half inches long. I understand the largest recorded Bullfrog was 10 inches long and weighed about three and one-half pounds, which is really big for an American frog, but small compared with its relative from West Africa which may weigh as much as 13 pounds.

Our Bullfrog has a rather varied assortment of acceptable food. It eats anything, practically, that it can swallow, which includes small turtles, snakes, frogs, crayfish, and small ducks. In turn our friend is cherished as food, at least when young, by large turtles, snakes, larger frogs, water birds, fish, and of course such things as crows and raccoons which occasionally catch a Bullfrog. All those are natural enemies. Of course we must not overlook the human angle, as these frogs are widely known and favored as food. The parts eaten are the hind legs, although in a really big frog there is enough meat on the front ones, too. Although I have no exact data I understand the legs often twitch and jump all the while they are being prepared and sometimes until eaten. This is caused by involuntary muscle contraction.

Next on our list is the Pickerel Frog. This is one of our two spotted forms, and looks like this: the ground color is light gray on the back and shades off to white on the belly. Down the center of the back there are several rows of squarish spots, but these are not arranged in much of a pattern. A good feature for identification is the yellow thighs of adults. It seems to me that this form is much more common along very rocky mountain streams, for the majority of the ones I have seen, both locally and in other parts of Virginia have been in this type of locality. I must say that this statement applies to adults. Very young specimens may be found some distance from water.

Two other forms which probably occur here, although sparingly, are the Leopard Frog and the Wood Frog. The first looks remarkably like the Pickerel Frog but the spots are round and the folds of skin on the sides are much better defined. The Wood Frog is rather small and obscure, the color is brownish, and the identifying mark is a black patch of color on and behind each eye. This form is not so partial to water, and will probably be found in damp hollows.

To summarize a few items presented in the two articles on frogs it might be advisable to bring out the following points of interest: there are two kinds of toads found locally, four tree-frogs, and four or five frogs. The tree-frogs call in definite periods, from February to August as follows: the Cricket and Chorus frogs from February to about the middle of April; the Spring-Peeper from April until late May, and the Tree-frog from then until fall. The true frogs seem to be found in well-defined habitats, the Bullfrog along rivers and lakes, the Green Frog in small slow creeks and ponds, and the Pickerel Frog along rather steep rocky mountain streams. I have not seen the Leopard Frog in this region, except one preserved specimen, or the Wood Frog, which is probably quite rare in the mountains.

SKUNKS AND SKINKS

Richard L. Hoffman
August 25, 1944, *The Daily Review*

The two above-mentioned creatures are rather unusual in being so different but having similar names. Ever since the recent article on lizards I have been getting various questions on the differences of the two, and, in fact, a number still want to know what a skink is. As I feel certain that everyone is familiar with the common odor dispenser, I would like to first go into the skink matter again with hope of clarifying it, and then mention some differences between the two.

First of all, a skink is a reptile and a skunk is a mammal. There is

an awful lot of difference. It seems that most of the questions I have gotten on skinks were caused by the fact that the name does not imply the creature is a lizard. There are many kinds of lizards, just as there are of everything else, and skink just happens to be the name for one particular group of lizards. In case there are some who desire to refer to the group or members thereof as skink-lizards I suggest using the same nomenclature on other things. If for instance, a person had never heard the word "robin," he would not be expected to associate it with a bird, neither would he be expected, upon learning the identity of the word, to refer to the species as "robin-bird." So, in summary, skinks are lizards. We have five kinds around here, and most of these are very similar externally. Despite common belief, the kind called Scorpion or Red-headed lizard is not poisonous.

There is a lot of confusion about the word "animal." In general use it is applied to the large common creatures such as deer, fox, squirrels, rabbits and the like. In other words, it is applied to any creature which has four legs and fur or hair. That system is all right for common usage, but it is much better to use a more appropriate word. Actually, the word "animal" may be applied to any living thing capable of motion (Plants, of course, move about to some degree in growth, but that is not self-propulsion.) So almost anything is an animal, from one-celled ameba on up to, and including, humans. And while it is not incorrect to call a skunk an animal, it is ambiguous. Take for example, the elm tree on D street. Surely nobody refers to it as a plant. It is properly called a tree, although a tree is a plant. So it is with skunks, and all other furred creatures. They are animals, true, but the more exact term would be mammal. A mammal is an animal which gives birth to living young and nurses them until they have grown; it has warm blood, and usually four limbs.

Now for the comparison: a skink is a reptile; it has cold blood; its body is covered with scales; and young are hatched from eggs. A skunk is a mammal, and has all the traits mentioned above. There should be no difficulty in getting them straight.

We have at least two kinds of skunks around here, and another occurring farther east in the state may be found also. Inasmuch as few people wish to be around the creatures, I will give a few points on their differences. The larger of the two species is called the Striped Skunk, because the pattern is made up of stripes on the back. There is a wide white stripe beginning on the head but this divides into two or three at the shoulders. The rest of the color is black, and I think occasionally a skunk turns up which is entirely black. This form gets to be a little bigger than a large cat, but is somewhat heavier. The smaller form is called the Spotted Skunk, because the pattern is as follows: four stripes start at the head but go only as far as the shoulders, then break up into a series of spots.

The habits of the skunks are rather interesting, as well as the defensive mechanism, but as this article has dealt mainly with the differences between skinks and skunks there is no place for a resume of their habits. Possibly these may be taken up in a later article.

PARTURITION IN LOCAL REPTILES

Richard L. Hoffman
September 1, 1944, *The Daily Review*

One subject about which I generally get more questions than any other is whether snakes and lizards have living young or lay eggs like birds. The question is elaborate, as there is no set rule about this, there being several ways in which young are produced. Some snakes and lizards lay eggs, some bear living young, and there are intermediate stages.

All our turtles, being of the fresh water varieties, lay hard shelled eggs. Some species, like the Snapping Turtle, will go inland a long ways, occasionally, and lay their eggs in a very hot, dry place. The mother sort of digs in with her back legs, and the dirt which piles up on her back covers up the eggs when she crawls out again. The eggs require about four to eight weeks to hatch, and the young are about as big as a fifty-cent piece. When they first emerge from the egg they are equipped with a device on the nose called the egg tooth, which is used to break the egg shell. It drops off in several days. Also with the young is a portion of the egg yolk (the young develop from the albumen, or white) which is attached to the little fellow's stomach. It nourished him for the time he was inside the egg, and stays on for several days. The mother, as is always the case with our species, pays no attention to the children after the eggs are laid.

With lizards the process is about the same. The eggs are laid in a dry place and the sun hatches them out. The little ones are about one inch long, counting tail, when they hatch; the yolk is not so prominent, and does not stay on as long as with turtles. The eggs of lizards are usually rather soft shelled. One of the few North American lizards which produces living young, incidentally, is the Horned "Toad" of the Southwest.

The snakes have about three methods of bearing young. I call them oviparity, ovo-viviparity, and viviparity. The names are just used for convenience, they may be explained as follows: oviparity means simply laying eggs, just like birds. Viviparity is related to producing living young, and ovo-viviparity is the intermediate stage, where the eggs are laid but hatch very soon afterwards.

Oviparous snakes lay their eggs in the earth, usually in a bare sunny place, but occasionally in rotting logs, etc. Sometimes the mothers of one particular species will congregate and lay their eggs in one place. Our egg-laying species are as follows: Worm Snake, Hog-nosed Snake, Smooth Green Snake, Rough Green Snake, Blacksnake (whose eggs are rough, appearing to be sprinkled with coarse salt), Corn Snake, Black Rat Snake, Pine Snake and Milk Snake. The young of the two black snakes, incidentally, are not black. They are gray, with darker blotches or spots on the back. In fact, they don't get solid black for about two years. Young Milk Snakes have spots on the back and sides quite red, but these turn gray in several years.

Ovo-viviparous snakes are scantily represented here. Perhaps the only local snake in this group is the Ring-neck Snake. The species lays eggs with very thin shells, and the young hatch out very soon after the eggs are laid.

Viviparous snakes are rather common here. These forms bring forth living young, but the infants are enclosed in a membrane, from which they break in a short time. When the young begin to form in the mother's body they begin as eggs, but the shell doesn't develop and the young are merely coiled up inside a thin sack. There is a yolk, of course, and the young are attached to it, but they break away when they crawl around.

Our live-bearing species are as follows: the Common Water Snake, Red-bellied Snake, Garter Snake, Copperhead and Rattlesnake. The Garter Snake sometimes has as many as 30 in a litter. The young of the last two are perfectly formed at birth, and have fangs with full poison sacs in order. Usually, however, they are very tame when young and can be handled safely. If one were to be bitten by a very young copperhead there would probably be little or no ill effect, other than swelling, but it is best not to try it. Young Copperheads are about eight inches long when born, little rattlers are a bit bigger.

SQUIRRELS AND CHIPMUNKS (Part 1)

Richard L. Hoffman
September 8, 1944, *The Daily Review*

With this installment I would like to try my luck with our more common mammals. As a rule more people, especially the hunters, have had experience with these than with reptiles, so this change is inaugurated in hopeful expectation of arousing a bit more interest.

First of all, it might be a good idea to mention a few facts about the squirrel group as a whole. Squirrels are rodents, or gnawing animals, and are thus in the same order with the rats, mice, rabbits, gophers and beavers. A characteristic of the group in general is the presence of a pair of large gnawing teeth in the front of the upper and lower jaws. All the squirrels and their relatives can be told by the rounded bushy tail, as the other rodents have either scaly tails or none at all.

In western Virginia there are four species of squirrel, one of which is common squirrel have rather similar habits and life history, so these can be summarized together and then the various forms taken up separately as regards color and size.

First, they are mostly arboreal, tree-dwellers. But they are not strictly so, frequently traveling about on the ground; and so are intermediate between the chipmunks, which rarely climb trees, and the flying squirrels, which seldom go about on the ground. All three kinds usually have two kinds of nests, one which is installed in a cavity in some large tree, and another which is constructed from leaves, sticks, etc., and placed in the branches of a tree. The leaf-built nest is used only in the summer, and may correspond to the summer camps which human beings have. Most of the time the "summer house" is built in the same tree which houses the permanent dwelling, but they are sometimes found in small trees, usually oak, where they appear to have been converted from old bird nests.

The food of all three forms is rather similar, but there is a wide variety. The most usual food is, of course, nuts and acorns, but the following items are also accepted: berries, buds of trees and other plants, fruits, seeds, fungi, insects, and of course, seeds of pine trees and other evergreens. It is known that squirrels, especially the Red Squirrel, are fond of mushrooms, but it is a mystery how they know to choose edible varieties instead of poisonous ones.

Their enemies are varied. Perhaps the worst are hawks, particularly the Red-shouldered Hawk. Owls sometimes get young squirrels, and possibly crows might kill a young one. Among the mammalian enemies are foxes, wildcats, minks and especially weasels. The only local snakes which feed upon squirrels are the Rattlesnake and the Black Rat Snake. And besides these there is a small assortment of invertebrate parasites such as trematode worms. The preceding list includes the natural enemies. Hunters are also a drain on the population and in some places house cats are a menace to the young. There is usually some debate about whether or not squirrels eat birds' eggs. This argument is supported by some who advocate wholesale reductions in squirrel populations for the sake of the little birds. While I am not grimly prejudiced against birds in general, let it be known that they have few enough natural enemies, and if these are reduced or removed we will be blessed with as many, if not more, little and big birds as we have been by the large numbers of starlings in recent months. While inauspicious at first, these disagreeable birds have become a nuisance because of their great numbers. Such usually results when the balance of nature is interrupted.

And now for the squirrels themselves. The most common, perhaps, is the Common Gray Squirrel. This is a well-known animal about nine inches in body length with rather yellowish-brown or gray fur on the back, that of the underparts being white.

The next most common form is the Eastern Red Squirrel. The fur of this form is light-reddish or chestnut-brown and white underneath. This form is by far the noisiest of the three, and the most curious and energetic.

The largest of our forms is the Black, or Fox Squirrel. The body is usually over 10 inches when the Flying Squirrel, and one species of chipmunk. The three kinds of adult, with a total length of 25 inches. The color varies from black to dark gray, occasionally mottled.

SQUIRRELS AND CHIPMUNKS (Part 2)

Richard L. Hoffman
September 15, 1944, *The Daily Review*

The common local squirrels and their characteristics were taken up last week, so tonight the subjects are the Flying Squirrels and the Eastern Chipmunk.

When one hears the "Flying Squirrel" he is apt to think of a bird-like creature which soars about from tree to tree in true bird fashion. Such is not actually the case, for the activity which gave the Flying Squirrel its name is really a kind of gliding. Whether or not this species is common here I cannot say, for its nocturnal habits render it very secretive. It does occur, however, sometimes even in the residential part of town.

The Flying Squirrel looks much like a very small Gray Squirrel, being not over 10 inches long and grayish-brown in color, but is characterized by having an extension of the skin of the sides of the body extending from the fore to the rear legs. In addition the tail is rather broad and flat and besides adding "wing area" it may be used to maneuver the squirrel into position when landing. The usual way of travel is for the squirrel to climb to the top of a tree, glide to the base of another, climb this, and so on. The glide is rather steep, being about 20 to 50 degrees, depending upon the animal's desire and the wind condition. When the trees are close together the species can travel from one to the other like other squirrels.

As mentioned before, the habits of this form are nocturnal. They live in colonies often, and usually in some place where nuts are plentiful.

Like the other squirrels this form also builds nests from leaves and twigs, and usually in some tall nut tree. They seem to be better built than those of common squirrels, but it is not known whether they are occupied in winter or not. The food (mostly nuts and seeds) is collected in the fall and stored in a cavity in a large tree, not in logs or other places on the ground.

The Eastern Chipmunk is well known to most. It is quite common in our locality, often occurring in the residential districts, and sometimes a long way down Smith Creek. This little rodent is quite closely related to the squirrels, but differs conspicuously in color and in having a shorter and less bushy tail. The pattern is made up of five black stripes on a reddish-brown ground color; the color underneath is white. The total length is about nine inches.

This is a very active species, usually running about during the day and retiring to its den at night. The den is usually a burrow constructed by the chipmunk in a thickly wooded area, and quite often in rock piles. It has more than its share of troubles, for many kinds of enemies beset it. Among these are: hawks, owls, wildcats, foxes, weasels, mink, and occasionally bear, in addition to several kinds of large snakes which like it. Fortunately the small size keeps it from being much hunted by humans.

Usually chipmunks may be seen abroad in the evening and morning, although sometimes they are out in the middle of the day. They have been often found under logs and large stones. Perhaps the greatest number I have seen and heard locally was along the top of Warm Spring Mountain on July 26 of last year. Only one or two were seen until the top of the mountain was reached, but from then on they were in great numbers, chirping loudly from the roadside brush, and often scurrying across the road. When pursued they usually had some hole or log in mind to which they retreated.

ARTHROPODICAL MISCELLANY

Richard L. Hoffman
September 22, 1944, *The Daily Review*

That is just another way of saying "general notes on creatures with jointed legs," so don't turn the page yet. This article, to present an abstract, deals with such creatures as insects, spiders and centipedes, to say nothing of the closely related crayfish. It is an introduction to a few subsequent articles to follow on these subjects, so no mention will be made of local species in this column. It might be a good idea to clear up a few much confused names, so attention will be called to these also.

To begin with, the animals under discussion are characterized by having no interior skeleton and by having two or more joints in the legs. The group is divided as follows: crustaceans, represented by the well-known crayfish or "craw-fish"; insects, of which bees, ants, grasshoppers, etc., are examples; arachnids, nothing more than spiders; and myrapods, or "many-footed" animals, illustrated by centipedes. This joint-legged group is the largest known group of animals, there being over 500,000 kinds of insects alone, with 65,000 kinds in the United States. I have no idea about exactly how many

occur in Virginia, but 7,000 would be a safe guess. The former curator of insects at the American Museum of Natural History found over 1,000 kinds of insects in his back yard near New York City.

I cannot attempt to mention the great economic importance of insects. Everyone who has a garden understands the great damage caused by them, but actually there is a very small minority that have anything at all to do with gardens. It is believed that if most of the insects' natural enemies, especially birds, were exterminated, the human race could not exist for very long. There are insects that make silk and those that eat it, insects that are used to make shellac and certain beetles which eat that, too. And the list could go on and on.

Spiders are well-known, especially the Black Widow Spider. There are many kinds of poisonous spiders, but only the Black Widow seems to be able to kill a person.

The crayfish and centipede groups are rather small and insignificant here, so little attention will be devoted to them.

Now, most people think spiders are insects. Inasmuch as they all look alike at a glance, one can see the difference in the number of legs. All insects have exactly six legs, and all spiders have eight.

Almost everyone uses the words "insect" and "bug" as synonyms. I have nothing in particular against this usage sometimes employing it myself, but the situation is much more involved than that. The word insect is used to describe any of a group of creatures which has six jointed legs and no internal skeleton, just as the word "bird" is used for a creature which has a backbone, warm blood, feathers, wings, and which lays eggs. But there is a multiplicity of kinds of insects, just as there are of birds. The most common groups of insects are the beetles, flies and mosquitoes, bees and ants, butterflies and moths, AND bugs. A bug is an insect which has a pair of unequally thick wings on each side, the outer ones being rather leathery and overlapping. Similarly, a hawk is a bird which is more or less characterized by having long sharp claws, hooked beak and lacking a gizzard. The point I wish to make clear is: the word bug shouldn't be used in application to insects in general, just as hawk isn't used to designate just any bird. While it is perfectly correct to apply "bug" to the critters which work on squash and gourd vines, and certain other forms, an ant isn't a bug, nor is a bee, nor is a butterfly.

Now, with these facts in mind: spiders are not insects, and a bug is a definite kind of insect, there should be no trouble in getting through the series of articles to follow on our more noteworthy joint-legged citizenry.

NOTES ON SPIDERS

Richard L. Hoffman
September 29, 1944, *The Daily Review*

As mentioned last week spiders belong to the group of jointed legged animals which have eight limbs. There appears to be some kind of rivalry between the parts of the spider's body, for the head, not to be outdone, installed eight or more eyes, to keep up with the legs.

As a group they are fairly well known, especially the Black Widow, whose bad reputation causes trouble for all the rest of the spiders. People usually want to know which spiders are poisonous. That is an easy question to answer. Almost all are. Let us hope that won't be a signal for a spider killing campaign. If the question were changed to "Which spiders are dangerous?" the answer would be much different, for locally the Black Widow Spider is the only one capable of causing trouble. The thought that most spiders are dangerous to some degree isn't so bad when it is recalled that the stings of bees, wasps, etc., are also poisoned.

In a general way the group under discussion is quite unique. Besides the large number of legs and eyes most of the species are built for making food-catching contrivances, called webs. Because of the built-in fixtures for making webs, the abdomen of a spider is usually the largest part of its body. The abdomen is also stuffed with various organs including what passes for lungs, so the small chest or thorax farther forward is concerned chiefly with the legs. The web is manufactured inside the creature much as rayon is made and the finished product comes out ready to be used. Most of the web handling is done with one of the back legs, if one will notice. The web itself is not sticky all over, but has tiny beads of a "gluey" nature built in at regular intervals.

The habits are quite varied. As a rule most build webs to catch food, while some count on what they can get by jumping on unwary insects. The care of the young is unusual, for in most lower animals they are left to themselves when they are born or when the eggs are laid. In the case of most spiders, however, when the eggs are laid the mother stands guard over them or else carries them around on her back until they hatch. The latter case is usually the rule with species which build no webs, and when the young of such forms hatch they follow their mother around or ride on her back. No doubt many readers have seen such occurrences. After so long a time the young are ready to leave and set up their own web-keeping, if they belong to the web making group. Some, such as the Garden Spiders, have interesting ways of dispersing themselves. On a warm breezy summer day they crawl to the tops of plants, and begin making a long string of web. When they have produced so much, the wind catches it and the attached infant, and the whole assembly is air-borne until the wind stops or an obstruction is encountered.

Spiders are quite beneficial to man, since all their food consists of various insects, and a very large number of insects must be destroyed by spiders every year. Their webs are used in various optical instruments such as telescopes and range-finders.

Despite having webs and various other protective aids spiders have a number of enemies. Perhaps the worst are birds. Wasps come next, and green snakes also eat them. Another enemy which only recently I discovered to prey on spiders is the Skein Centipede, or Wall-runner, which is the long legged centipede usually seen in cellars. The spider is safe enough during the day, but if he ventures out at night he is liable to killed and eaten by a Wall-runner. Wasps usually sting spiders to semi-paralyze them, then carry them off to their mud homes. The spider in his doped state is dumped into a corner, then his host lays eggs on him. The eggs hatch out into wasp larva which eat the spider alive. This is a gruesome business but necessary for the wasp, for if he killed the spider at once it would decompose or dry up before the eggs hatch out. Occasionally a wasp runs into a tough spider web, then the occupant revenges his fellows by feeding on the wasp.

The feeding job is an interesting one which warrants description. Usually the web is built with an attached house for the spider a little distance away, but everything is so strong that when an insect runs into the web the vibrations of the impact and subsequent struggles are carried up strands of web to the home of the occupant, who rushes out to seize his prey. If the victim is small he is bitten and poisoned on the spot, but if he is big and tough the spider usually grasps him with two legs and turns him around and around, all the while wrapping him up in web. When this is done the meal is then either eaten on the spot or cut loose from the web and carried off to the afore-mentioned house. The method of eating is easy and simple, the spider merely sucks the liquid parts of the victim's body, then discards the "shell." Either because of a vicious disposition or reluctance to waste its venom the spider usually eats the victim alive. Insects and their relatives have a very sad time when caught by enemies.

There is one more trait which is worth mentioning. Mrs. Spider usually goes her human counterparts just one better, which is to kill and eat her husband when she tires of him. The males never seem to learn, and the next year there is another willing to try to make a got of it.

The next installment will deal with some of our common local species, their habits and features. We have a large number of kinds, but only the best known will be mentioned.

SOME LOCAL SPIDERS

Richard L. Hoffman
October 6, 1944, *The Daily Review*

After some considerable delay in introductions we are now ready to take up some of the more common and note-worthy representatives of our local spider fauna. The general habits and features of spiders have been taken up at some length in previous columns, so this article will deal with the individual characteristics of the following species:

1. The Black Widow Spider. The only spider known to be able to cause the death of a human with its bite, this species is not at all rare in this region. Although commonly believed to be large, the Black Widow rarely, if ever, exceeds an inch in total length. The color is shiny black, with, of course, the bright red hour-glass shaped mark on the lower surface. The size and shape of this mark varies greatly; in eastern Virginia there may be a row of these spots around the end of the abdomen and onto the back. It seems that this species is partial to dry places, and especially to shrubbery. I know of many cases of its being found in hedges and shrubs, and have personally found it in the dry earth about the roots of certain kinds of flowers. Of course the species is often found in houses, in basements and attics especially. One should avoid putting his hands in dark dry places in the basement without first looking for spiders.

2. The Wolf Spider. This is a rather large species which seldom builds a web. It is rather long, with a slender body; the color is light gray. It is this species which is commonly seen carrying its young around.

3. The Jumping Spiders. There are several kinds but these look much alike. The Jumping Spiders do not build webs, but creep about on lumber and such places and capture food by slowly advancing, then jumping upon the victim. This species is easily told by the short thick body, which, with legs, is as wide as long; and by the light gray "fur" with patches of brown on the back.

4. The Garden Spider is possibly the best known. It is a large species, up to two inches long, and is brilliantly marked with black and bright yellow. The abdomen is much larger than the rest of the body, and the legs are long and slender. The large round web is usually built in low bushes and between large flower stalks.

5. The House Spider. This is another well-known species. It is not the kind that annoys housewives by putting up webs in corners of ceilings, and is usually found outside. The favorite place for construction of the web is in the corner of two outside walls, preferably with protections from the weather. The webs are always more or less triangular and quite flat, and are equipped with a little tunnel made of webbing, which the spider built to hide in. Another favored habitat is among hedges. This is a very harmless and useful species.

6. The Crab Spider. Not as well known, perhaps, as the previously listed kinds, this little creature lives in the woods mostly. It is small and rather squarish in shape, looking somewhat like the Jumping Spiders, but not having conspicuous "fur" on the body. When disturbed the front limbs are extended straight out in front, but the usual position is when they are thrust forward and bent over in front much like the forelimbs of a crab.

7. The Shell Spiders. The members of this group prefer wooded areas for habitation. These creatures may be easily recognized by the peculiar abdominal section, which is tremendous in proportion to the rest of the body, and is quite hard and spiny. The Shell Spiders build their round webs between trees and bushes, always several feet from the ground. They usually do not build a separate house because of the trouble in carrying their large body along, but hang in the center of the web. In certain times of the year when insects are especially numerous, or swarming, the webs of Shell Spiders become practically covered with small bodies.

8. To end our list it seemed proper to choose a little known but very interesting species, the Diving Spider. This little fellow had diving bells and submarines beat by several million years. The house is made of silk-like webbing on the bottom of a pond or slow creek, and periodically the occupant goes to the surface, gets a bubble of air, and carries it to his nest, where it is used as needed. I have seen but a few of these creatures around here, but they probably aren't rare at all.

Next week I will take up the spider's nearest relatives, and in case anyone thinks I have omitted a worth-while spider from tonight's list, I would be happy to mention the neglected species.

MYRAPODS AND HARVESTMEN

Richard L. Hoffman
October 13, 1944, *The Daily Review*

Closely related to the spiders are scorpions. We are fortunate in having none of these creatures in this state, for they aren't found much farther north than central Georgia. However, also very close to spiders are ticks, which are well known in certain regions but don't seem to be common in the Clifton Forge area. Perhaps others have had different experiences, but I have hiked in the country north and east of town for over six years and have never seen or picked up a tick. On the south side of Richpatch mountain, however, the situation is different. The first time I went to Glen Wilton I picked up one. It appears that the local situation is caused by the much greater number of cattle and other livestock down the river. The kind common to pastures and such places are Cattle Ticks; those found in the woods farther east and south are Wood Ticks. It is doubtful if the Rocky Mountain Spotted variety occurs here in any numbers, if at all. Possibly Highland county, with its large sheep population, might be more favorable for the Fever Ticks.

But back to the subject inferred by tonight's heading. There are several kinds of "thousand-leg bugs" to be found locally, but at least one of these is so small and secretive it doesn't merit mention. Three kinds may be found here in considerable numbers, the Centipede, Millipede, and Skein Centipede, or "Wall-runner." Actually none of these creatures have 100 legs but have either too many or too few. The Common Centipede comes closest, but never has an even hundred.

Our Centipede is usually seen near or on lumber of some kind. When disturbed it runs away with great speed and takes cover in some crevice.

Although usually peaceful enough, the Centipede can deliver a very powerful sting. Bite would be more accurate, for since the creature eats other small insects it is equipped with fangs and poison for subduing its victims. Our local species seldom gets over three inches long, so we may be considered lucky. Certain tropical forms exceed 12 inches, and the bite is as bad as that of a young Copperhead. The Blue Centipede of our Southwest is unusual in having a bright blue body and yellow legs.

The Millipede is seldom seen in town, but is a woods inhabiting form. Almost everyone has seen these slow creatures, with their hard, round, shell-like bodies and hundreds of tiny hair-like legs. They are commonly found run over in roads, and are often found under logs and stones in damp wooded places. The Millipede does not have the poison fangs of its relative, and being unable to run rapidly merely rolls up into a spiral when disturbed. Its manners are very good, for it does not kill and eat other small creatures, being content as a vegetarian.

The species I referred to as "Wall-Runner" is almost entirely an urbanite, sticking closely to cellars, attics, and other dark places about the home. Surely almost everyone has seen it, a smallish creature with very long slender legs, which runs at great speed. I have often wondered just how the creature could manage to work all its limbs without becoming hopelessly entangled. The Wall-runner is similar to the Common Centipede in feeding habits, being equipped with fangs, and although it can deliver a powerful bite it rarely does so. It is seldom seen about during the day, for it is at night when the Wall-runner prowls about looking for what it can find to eat, usually roaches, spiders, etc. The creatures are common in my basement, and at this writing I can see one emerging from a crevice in the wall. If

anyone should desire to catch these creatures he might try the following method, which always works for me. Take a glass or jar and put a little water or soft drink in it, then set it against a basement wall. I have found them to be more partial to carbonated drinks, although why an insect-eating creature should be I cannot tell. When kept in captivity, the Wall-runner isn't bashful about eating flies and other insects, and, I suspect, smaller Wall-runners.

The Harvestmen, which were mentioned in the title, are represented in the local fauna by one common species, which is known commonly as "Daddy Longlegs." This awkward fellow is almost all legs, with a tiny body riding high off the ground. It eats small insects such as plant lice and is quite harmless to man. The usual habitat is some shady patch of woods.

A note on the names used tonight may be of interest. The common name "Thousand-leg Bug" is a literal translation of Millipede, which is composed of two Latin words: mille, a thousand, and pes, foot. Centipede is much the same, although the Latin centum meant a hundred. These are not the present technical names used for the creatures, so whether the Romans or someone later on named them Centipede and Millipede is a matter of conjecture.

During the past three years I have had at least two persons tell me of seeing a lizard about six inches long, which was black with orange underparts. If there is anyone among the readers of this column who has seen such a lizard I would appreciate it highly if my attention were called to it. Bear in mind that reference is made to a true lizard, and not a spring-lizard or salamander.

AN UNAPPRECIATED PUBLIC SERVANT

Richard L. Hoffman
October 20, 1944, *The Daily Review*

The title of tonight's installment has to do with our common local crayfish, or crawfish, as it is better known. It is a common enough species, but its beneficial habitats are unknown to most. It seems appropriate that it should receive some sort of recognition in the form of a report on certain of its habits and ways of life.

The crayfish, and we will call it by the more properly accepted name, is a member of the group of animals with jointed legs, or arthropods. It is closely related to the lobster and crab, and our local form is rather small, on the average, when compared with more southern species, some of which get six or seven inches long. A few facts about its structure may be of interest. It seems to be a creature more interested in where it's been than where it's going; for when it swims it uses the tail to pull itself through the water backwards, and can attain quite respectable speed in doing so. Of course when it wishes to prowl along at leisure it goes forward using its smaller legs, holding the pair of large grasping claws aloft. Most people believe that soft-shelled crayfish are different kinds, but actually they are merely the common kind which has recently shed, or molted, its hard shell. This is done about once a year, and for some time the new shell is quite soft.

Do you wonder what makes the shell get hard after a time? That item is provided for in the form of two small hard white objects within the creature's body. These are known by a number of names, most pertaining to the fact that the owner of some of these stones will be blessed with good luck. Actually these objects are formed prior to molting on the stomach walls; when the shell is shed they dissolve and are absorbed through the circulatory system to be used in hardening the new shell, since they are quite similar in composition to calcium or lime.

Space limits the amount of information that can be mentioned about the crayfish, so the most important details about the life might be summarized as follows:

The eggs, instead of being laid or deposited in some sort of nest or hiding place, are carried around by the mother under the posterior part of the abdomen until they hatch. Even then the young hang on in the same region until they have grown a bit, then they go off to live alone. The food consists of any small water animals that he can overcome; also, as in Smith Creek, any kind of vegetable or animal refuse available, including a great deal of carrion. The little creatures live in crevices and under stones in shallow water, and shed several times the first year. About the time they are three or four years old they usually construct a home on the creek bottom by tunneling under a rock, or just down into a sandy or loose kind of creek bed. These tunnels may be found by the little chimney of stones and dirt piled around the entrance. The adults usually feed at night, but have a very fine sense for detecting food, and will come out at any time to eat. The adults are rather like humans in some ways, for crayfish fight over food and other things, and it is quite common for some enterprising youngster to steal the food while two old fellows fight it out. They are quite fond of bread and such matter, and it is interesting to observe the activities of a dozen or more vying for some choice morsel.

The young specimens have considerable trouble from fish, mostly trout, and from frogs and water snakes. The adults' chief enemies are large birds, mostly crows, and also raccoons. Certain water snakes such as the Queen Snake (found in the Shenandoah Valley) live almost entirely off crayfish.

The value of the crayfish is as a scavenger. It is particularly useful in towns such as our own, with one or more creeks through the populated parts. A number of persons living adjacent to our streams find it convenient to use them to dispose of all sorts of refuse, including chicken entrails, head, feet; dead rats; dead fish; and the list could go on and on. If it were not for the crayfish, catfish, suckers, water snakes and rats which live along Smith and Dry creeks the appearance of those streams would not be at all attractive. It is a good thing that crayfish and other scavengers are not restricted to the vicinity of town, for it is comforting to know that they intercept most of the dead under-sized trout during and after the trout season, before said fish reach our water supply.

SNAKES WHICH EAT RODENTS

Richard L. Hoffman
October 27, 1944, *The Daily Review*

Of course the title applies to local species. This article is prompted by universal killing of snakes, especially those which destroy large numbers of rats and mice, despite their obvious value. Such snakes are of special interest to farmers, and indeed many realize their value. It is true that some people destroy such reptiles even though they are aware of their economically important feeding habits, but it is hoped that a better understanding of the local rodent-eating serpents may be gained from this article.

Most of our local species which feed in whole or in part on rats, mice, and other rodents are quite harmless, but there are exceptions in the forms of the Copperhead and the Rattlesnake. I cannot ask for conservation of these species, but such forms as the Black Snakes, which are known by all to be harmless, should be protected as much as possible.

Our local species to be considered are as follows, in order of their abundance: Common Black Snake or Racer, Pilot or Mountain Black Snake, Corn Snake and Milk Snake.

The first named, the Black Snake or Black Racer, is usually confused with the second form. Both are black and look somewhat alike, but the Pilot Black Snake is by far a stouter and more powerful species. It may be easily identified by its usually slow gait, stout body, and considerable amount of white or gray on the belly, often extending halfway back to the tail. In some cases there are a number of small white spots on the back. The Pilot Black Snake is often found in trees. Rodents form about half of the food of this snake. The Common Black Snake, on the other hand, is rather slender, and built for speed on the ground. It never has white specks on the back and the white of the underparts is restricted to the chin and throat. Besides mice and other rodents, the Common Black Snake also eats frogs toads, lizards, salamanders, etc. Both Black Snakes often frequent the vicinity of farm buildings in search of mice. Some farmers protect

them because of this.

The Corn Snake is often called House Snake, and shares the name with various other species. It is perhaps the most beautifully marked snake in the eastern United States. The color is usually some shade of tan or chestnut with 40 or 50 reddish-brown black-edged spots in a large central row on the back. Smaller spots alternate with these on the sides. The head is marked with spear-shaped lines, and the lips and throat are pure white lip, the scales outlined with black. The belly is white with alternating black squares. This species does not seem to be rare in this locality. Farther south it is rather widely protected, and is known as Mouse Snake or Red Rat Snake. The name Corn Snake is applied because of the creature's liking for corn fields, whence it catches field and meadow mice. The Corn Snake is a rather slow and gentle snake, and is related to the Pilot Black Snake.

The Milk Snake is so called because of the superstition that it sucks milk from cows. This of course is not true. It lives mostly on mice and other small snakes. In pattern and color it is quite like the Corn Snake described above, but may be distinguished from it by having a small head, not much distinct from the neck. It is also smaller, rarely getting over three feet, and has a round smooth body. The Milk Snake seems to be rather rare here and restricted to higher altitudes than most snakes. Farther north it becomes more common.

MICE, WHITE-FOOTED AND OTHERWISE

Richard L. Hoffman
November 3, 1944, *The Daily Review*

Since the subject last week was snakes which eat rats and mice, it might be of interest to mention some of our more common and interesting species of mice. The Common House Mouse is not included, for the creatures to be discussed are forest and field dwelling, and not at all like our household friend, either in bodily proportions or habits.

Wild mice are rather difficult to observe in their natural habitat, for most are quite shy and retiring. They cannot be blamed for this, for few creatures have so many enemies. For the most part these species are nocturnal, that is, active at night. Almost all have some kind of burrow or den to retire to in the day, and the kinds of nest vary with the species of mouse.

During the past three years L. M. Carter and I have seen most of our local species and have assembled some information about them. In addition to our observations there is considerable reference to mice in a recent study of the feeding habits of snakes in the George Washington Forest. Six species were found in snake stomachs, and this seems to be about the quota for western Virginia.

The White-footed Mouse is ideal to begin with. It is a very dainty and attractive little animal, not in the least like common house mice. The size is a bit larger, the body sometimes being about three to four inches. The head is larger and not so pointed. The fur on the head and neck stands out to give a plump appearance, and the mouse's ears are very large and round. In general the body is stouter in proportion to the length than that of the house mouse. The fur is much different, being some shade of chestnut or darker brown on the back and sides, with the underparts of the body and head immaculate white. The fur is very soft and sleek, and to set off the whole aspect is a pair of great shoe-button eyes. The movements of this creature are quite dainty and precise, little like the nervous hurried movements of "domestic" mice. While it is probably found in all kinds of terrain we have found it in some numbers along the top of Middle Mountain. Here, the white-footed mice live among the limestone rock crevices, subsisting in some places mostly upon acorns so it seems. Although references mention that this species usually makes its home in a renovated bird's nest, the ones we found along the mountain top built their nests under large stones. One such nest was found to be made of dried leaves and grass; when it was discovered the two occupants ran out and escaped in the rocks. In June this year we collected a small copperhead from under a stone which had sheltered a mouse nest. It is probable that the snake had taken over the rock after dispossessing the owners, who may have been eaten in the process. At Douthat Park White-footed mice seem to be fairly common. We found several in the stable early this year where they probably lived off what grain they might find. Besides by snakes the poor mice are preyed upon by weasels, hawks, foxes, wildcats, and other predatory animals. When taken captive they make very nice pets, becoming very gentle.

The Common Meadow Mouse or Field Mouse is rather similar to the House Mouse, but somewhat larger and with a short tail. The eyes are small like those of the common mouse. The color is usually some shade of brown, from chestnut to dark brown. The underparts are not white, but rather dusky gray or cinnamon. It is this species which causes much trouble to farmers by destroying grain and fruit. Although it has many enemies, the Meadow Mouse is quite numerous. It is estimated that if there were no checks upon increase, a single pair and their progeny in five seasons would amount to nearly 1,000,000 individuals! Instead of building a nest in a crevice or old bird nest, this species makes numerous burrows in the forest floor, just beneath the leaves. There are few places in the woods where one can dig down and not find a burrow nearby. These networks are made often by the mice in search of food, and are later used as refuges.

The Pine Mouse is very similar to the Meadow Mouse, both in color and habit. The two can be separated by the presence of hair on the feet of the Pine Mouse, which, incidentally, is not at all restricted to pine regions. It also burrows, and is partly responsible for the kind of burrows mentioned above. In some places they invade farm areas, and damage bulbs, roots, and vegetables left in the fields. In many cases these mice utilize mole burrows, and often cause the mole to be blamed for their damage.

The Lemming Mouse is a rather stout, grayish, unassuming kind of animal which seems to have a sleepy or dopey expression on its face. The eyes are quite small in proportion to the size of its body. The fur is much lighter in color than that of the other kinds listed. I found one last year which had rebuilt a bird's nest and was quite happy inside. When first found he soon escaped, but was back in the same nest the next day, and this proved his downfall, for he was caught.

The Red-backed Mouse may be told from all the rest by a broad chestnut-brown stripe down its back in contrast to the ground color. The species is essentially northern in distribution, and in many places is the most common mammal. It seems that the species is not common in Virginia, and is included in this list on the basis of a specimen from an unspecified place in the George Washington Forest. This specimen had been eaten by a copperhead, which suggests that the species prefers rather high elevations. This is the case farther north.

The Jumping Mouse is rare, if it occurs this far south at all. It is characterized by a very long tail, up to twice the length of the body, and by long powerful hind legs. The color is also different, being yellowish with the underparts white. There are two species in Virginia; one occurs east of the Blue Ridge, and the other form is found in the mountains in the northwestern part of the state. I have not seen it here, but it is of interest, nevertheless.

INSECT MISCELLANY

Richard L. Hoffman
November 10, 1944, *The Daily Review*

In this article several of our more noteworthy and interesting groups of insects are mentioned. The fact that there are probably over 2,000 kinds of insects to be found in this region accounts for the very general nature of the names and descriptions. Because of their small size these creatures are quite difficult to distinguish and many distinct kinds are separated because of the number of joints in the antenna, or in the legs, etc.

A few general notes on the structure of insects may be of interest. All have exactly six legs, although some may have very small or large appendages resembling legs. The legs and feet are very diverse in shape, structure, and use. In some the feet are equipped with claws for

clinging, and in the Common House Fly the feet are outfitted with tiny glands which manufacture a sticky fluid, the better to walk upside down with. The mouthparts also differ widely. Some are made for insects like the butterflies, which need a tube-like mouth; while species such as the grasshoppers which eat plants have small hard installations which chew up the food. Mosquitoes and certain others use the kind of mouth attachment which allows them to prospect for blood beneath some animal's hide. Insects in general fall into several large groups according to the structure of the wings. The beetles, for instance, have two pairs of thin delicate wings and when these are not in use they are covered by hard sheaths. The dragon-fly which operates over water and large open areas and doesn't need to have much concern for the wings usually rests with them outstretched from the body, while its first cousin, the grasshopper, always folds its wings back and the outer ones are rather tough.

A brief summary of the major groups, according to wing and other characteristics, will make it relatively easy to determine the general identity of most local species.

Beetles. Always hard-bodied, usually with short strong legs and without a long tube-like proboscis. Beetles are usually found under rotting boards and such places, often in logs, etc.

Bugs. Usually soft-bodied, without hard covering to the back. Our species have a long beak for a mouth, since most feed upon plants. The Squash Bug is familiar to gardeners, and a well-known and generally disliked species is the common Bedbug.

Grasshoppers, mantids and crickets. These are mostly familiar, except the mantids, which will be mentioned later.

Bees, wasps and ants. These are all closely related. The wings are in two pairs, quite thin and delicate. The first two have their weapons on the end of the body; the ants have theirs on the head. In South America, however, there is an ant which has both a stinger and powerful jaws.

Flies and mosquitoes. One pair of wings. Mouthparts in a kind of beak.

Butterflies and moths. While these are known to everyone, few people can tell them apart. A very easy way is to examine the two antenna, or sensory hairs, which protrude from the head. In the moth these are much like feathers, while those of the butterfly are slender and without small branches, although they are usually knobbed on the end.

These are the most important groups. There are about 23 in all, but many are small and of no importance. In the next few installments an effort will be made to list the most interesting members of each group.

NOTEWORTHY INSECTS

Richard L. Hoffman
November 17, 1944, *The Daily Review*

As announced last week the subject tonight will be the listing of several noteworthy kinds of insects found here, some being common while others known only from one or two specimens. Since it is felt that the public has little interest in the many small and inconspicuous kinds only the more "spectacular" critters will be discussed. It is hoped that most of the main groups or orders of insects may be represented by an interesting delegate to this symposium.

The Click Beetles offer a peculiar but intriguing group of specimens to represent the beetles in general. To my knowledge we have two kinds here, one, the smaller and more well known, is an elongated black beetle which bears a conspicuous joint about one-third of the way back from its head. The value of this installation is best illustrated by collecting a specimen from under a flat stone or board and placing him upon his back. If a true click beetle, he will perform by giving a spasmodic jerk and describe a quick arc in the air, landing upon its six feet. The Eyed Click Beetle is known by many names including "Stonefly" or "Jar-fly." It is a rather large creature, being up to two inches and quite sturdy. Instead of being black this animal is gray with two large prominent eye-like spots on the back just behind the head. It performs just like the smaller edition but with more vigor of course.

The Bug delegate is perhaps one of the queerest of the lot. This character is a member of the Assassin Bug group, so named because of the predacious habits, and because of his peculiar anatomy is called the Wheel Bug. He is a large tough looking thing, about one to one and one-half inches long, with a complement of six long spidery legs and a long beak capable of causing pain to man or beast.

The name is derived from the strange shape of the back. Instead of being flat and smooth, the hard shell of the back is piled up into a high sloping roof. Along the crest of this feature are many small projections which resemble the cogs of a gear wheel. It's a far cry from such projections to a wheel, but I suppose the name is as good as any. As mentioned before, the beak is capable of penetrating the human skin, but the bug commonly uses it to the agriculturist's advantage, by impaling caterpillars with it and using it much as a soda straw.

Another character of great interest, to me at least, is the Ant Lion. When adult this fellow looks much like a small dragon-fly and is generally dull. The infant or larval stage provides the talent for the group. The larva is commonly known as "doodle-bug" and may be found in dry sandy places, where it may be detected by the presence of small cone-shaped pits in the dust. Many people have been much surprised to learn that a "bug" lives therein, but it is so. The young Ant Lion is a runty little fellow, rather clumsy and front-heavy with a pair of large jaws, but is quite at home in his native element. The pits are made by the simple way provided by nature. The larva creeps into the dirt just below the surface and with a sudden snap of the neck the dirt on the head is pitched up and to one side. When this is repeated long enough the pit results, and the occupant digs in at the bottom just out of sight. To get action secure an ant or small insect and drop it into the pit. The insecure nature of the dry dust of the side renders escape impossible or difficult, and usually a pair of jaws from the bottom of the hole seize the victim and pull him under. One would be surprised at the difficulty involved in finding the owner of the jaws, however. Let an interested reader try this next summer.

Next on the list to claim distinction is the common "17-year locust." First of all it is made clear that his proper name is cicada. Locusts look much like common grasshoppers, and not at all like the fat clumsy creature which is so common here in early summer. The 17-year part of the name is usually correct however. The life cycle is, briefly: the eggs are laid in the ends of twigs during the summer, and the process kills the end of the twig, causing it to drop off in time. Usually the eggs hatch out into small grub-like things which burrow into the ground and pass the next twelve to seventeen years (depending upon the latitude) as a grub which lives off of juices sucked from tree roots. When the time comes to emerge as a winged adult the larva crawls up the trunk of the tree which has supported it and as it clings to the bark the skin of the back splits open and the adult form comes out, complete with wings. The dry skin remains on the tree until washed off by rain or destroyed otherwise. There are two kinds locally, the common one being rather greenish, while the 17-year cicada is brownish. The call is a high shrill buzz or whistle and is made by two small disks under the wings of the males. At any rate it is certainly complementary to hot dry summer afternoons. In the early summer the first scattered specimens to begin calling about the quiet woods add a very attractive note to the scene.

NOTEWORTHY INSECTS, PART 2

Richard L. Hoffman
November 24, 1944, *The Daily Review*

Continuing the subject broached last week, the topics of discussion tonight are a few more of the hexapods found locally that are of some interest because of their unusual physiognomy, habits, or economic importance.

The order in which are included such creatures as grasshoppers, locusts, crickets, and the like, has three members that are well worth note herein.

The Praying Mantis is a rather sanctimonious creature. It derives its name from the way it holds the front pair of legs when at rest, which causes it to seem to be "praying." However, because of its very predacious nature the name is often spelled "preying," which is just as appropriate. The creature is very slender, up to three inches long, with the abdominal parts about half the length. There are two pairs of wings which are quite long. The head is wider than the body, and the eyes protrude outwardly. The usual color is green, with the underparts yellowish white. Although it has very usable wings, the Mantis usually prefers to go by foot, holding the two front legs aloft and folded nicely. The same legs are used to capture and hold the Mantis' victims. The Mantis is not rare here, as some insects go, but is definitely not common. I am aware of about six different specimens being found here.

A near relative of the Mantis, although one would hardly think so by outward appearance, is the Walking Stick. This is a very strange critter, which gets along in the world by resembling an old dried twig or branch. This species is more or less common here, and no doubt many readers have seen it, but for those who haven't a description follows:

The total length is about three inches in large specimens. The width, however, is about one-eighth inch at the body joints, slightly more slender in between. The limbs are very long and fragile, being about as big as pencil lead. The color is usually brownish-gray, sometimes otherwise, but always very drab and inconspicuous. The movements are slow and seemingly deliberate. When disturbed, the Walking-stick usually becomes perfectly still with the feelers and front legs extended straight forward. In this pose the creature is unbelievably well hidden. Since the habitat is most often in pine woods and such places, the Walking-stick is very safe from most enemies when not in motion. However, the large size and awkward movements render it conspicuous when it is in open country.

An insect of a different nature is the Hellgrammite. Doubtless those who have used this common and grotesque creature for fish bait will be surprised to know that it grows into an adult stage with wings. The commonly known form is the flat, many-legged creature which is found under rocks in water and which is equipped with a strong pair of jaws. This stage corresponds to the caterpillar stage of the better known and liked butterflies. When the Hellgrammite grows up it is known by various names, one of them "Dobson Fly." It is a very large and robust thing, which gets about two inches long and it is built very stoutly. The wings are large and heavy with large veins in them. The head is larger than the body, and in the male the "pinchers" of the water-living juvenile are retained in a magnified proportion. The jaws are so long as to be of little use, and would seem to be rather cumbersome. The adults are most often seen along rivers, where they fly just above the water making a very creditable amount of noise.

Another member of the Mantis-Walking-stick-Grasshopper group is a little monster called the Cone-headed Grasshopper. This is a small edition of the common kind, which differs in being bright and classy with an attractive green complexion. The head is swept-back and tapered, so to speak, with the top being well forward of the bottom or mouth. It is cone-shaped, hence the name. The interesting feature about this fellow is the long extension of the abdomen into a slender tube. This is often about one-third as long as the body, and I once used to think it was to sting meddlesome boys with. Since then I have fortunately learned that the device is used for laying eggs in deep holes and Nature didn't have humans in mind when installing it.

All of the insects mentioned in this article are represented, I think, by specimens in the possession of the Biology Department at the High School. These were displayed last Tuesday night and no doubt many visitors saw them. It is hoped that they will be able to correlate correctly the notes in this article with the insects they saw.

LO, THE POOR MOLE

Richard L. Hoffman
December 1, 1944, *The Daily Review*

In the midst of our local wildlife we have a much maligned and generally mistreated creature. Perhaps in some cases persecution of the victim is justified, but this is seldom. I have in mind the common mole, or rather several kinds of moles which are not unduly common here. The chief accusations against them refer to the damage they supposedly do to roots, vegetables, etc., in addition to raising mounds or ridges of earth in lawns. That latter disfigurement does not seem to occur often here, so there is little that can be said against them for it. On the other charge, the following defense may be made. Moles and their relatives, shrews, are classified as insectivores, or simply insect eaters. The nature of the teeth, jaws, and observed feeding habits indicate that. Adapted to a strictly underground life, they feed upon earthworms, grubs, cutworms, wireworms, beetle larva, and other similar pests. For some hazy reason, probably because of the high body temperature necessitating much food, the moles are quite voracious and greedy. They will die if separated from food for several hours, and it has been estimated, on the basis of observations made on captive specimens, that a single mole may eat as much as fifty pounds of insects per year.

Because of the subterranean life followed by moles, they are so adapted that identification is quite easy. The eyes are quite small, sometimes hidden in fur, and probably of little use. The ears likewise are small, and the tail is short and thick. Very conspicuous are the large front feet. It is with these that the mole digs. The palms are turned outward, and when digging the mole pushes these together forward, until they touch the nose, then forces them apart, the motion also pulling the body into the space made.

The several kinds mentioned are as follows:

The Common Mole, which is our commonest form, is about six inches in total length. The color is gray, sometimes tinged with brown or silver, with the feet and tail white.

The Star-nosed Mole. This form gets its name from a very peculiar appendage on the nose. This is a small rounded sensory disk with 22 feelers equally spaced around it in a fringe. In general color it is darker than the Common Mole, and the feet are dusky instead of white. In general this species prefers damper habitats than does the Common Mole. It differs in habits from the others by occasionally making burrows during the winter.

Brewer's Mole may easily be separated from the others by having a very hairy tail. In coloration and habits it is similar to the Common species, although it may be darker.

The moles seem to have very little of anything that might be called intelligence. They are known to be quite vicious, fighting when two are put together. The front teeth are capable of giving a painful bite.

The only factor that might be used against the moles is that their burrows allow mice access to roots, vegetables, etc. Mice are known to cause considerable damage to such things, but as many kinds are able to make their own burrows, the few that the moles inadvertently let in could hardly offset the insect-destroying value in the mole. Still, in many places where moles are more common than here, people hunt them relentlessly, and mail-order houses supply specially built mole traps.

RING-NECK, WORM, AND RED-BELLIED SNAKES

Richard L. Hoffman
December 8, 1944, *The Daily Review*

In a previous article on parturition in local reptiles brief mention was made of the above listed snakes. All are of small size, and this, with their inconspicuous coloration, makes them little known to the general public. In habits generally they are similar. All are secretive,

usually hiding during the day and seeking food at night. In general temperament they are all good-natured and may be handled without the danger of being bitten. The size, coloration, and feeding habitats vary so much that individual accounts follow:

The Worm Snake was rather aptly named. At first glimpse it may quite resemble a large shiny worm, and the burrowing habits lend credence to the name. The maximum size is 13 inches, but I have never found any that large here. Usually females get somewhat bigger than males. The head is small and pointed, being much smaller than the neck region. Eyes are small and resemble black beads on the tan head color. This species is unusual in being devoid of markings, and the only different colors are those on the dorsal and ventral surfaces. The belly is rather pinkish and this color shades on the sides to the usual tan or brown of the back. The tail is quite short and thick, in keeping with subterranean habitats, and is equipped with a small pointed scale on the tip. When handled these little snakes often attempt to root between one's fingers with the head; the tail is used for that purpose and also for leverage for the head. The feeding habitats indicate that the snakes eat mostly earthworms and similar food, including fly larva and wireworms.

The Ring-neck Snake is doubtless more common and well-known here. Its larger size, greater numbers, and brilliant colors contribute to this. It is known as Black Racer, Ring-neck Racer, and by other names, and most believe it to be the young of the Black Snake. The maximum size is about 14 inches. The color is usually blackish or dark gray on the back, with the belly and neck ring yellow or orange. The chin and throat are white. In some cases the belly is marked with a row of black dots. The food consists largely of salamanders and earthworms. The habitat is usually some cool damp place with considerable shelter, although other places may be frequented. The species is not uncommon here in town, as many are found along both Smith and Dry creeks, and occasionally specimens turn up in various residential districts. In some cases people even believe these small harmless snakes to be dangerously poisonous, but this is a common thing when small bright snakes are considered. Let it be mentioned again that the Copperhead and Rattlesnake are the only poisonous snakes in this area, and the rest are of a necessity quite harmless.

The Red-bellied Snake is no doubt the rarest and least known of our trinity under discussion. I am aware of but six being found in this vicinity, but no doubt those who collect salamanders for bait have seen more. The coloration is distinctive and brilliant. The back is a somber gray or blackish, with a pale stripe down the center and with three yellow spots on the neck. The belly, however, is unmistakably colored. It is red, seldom pinkish, but bright red or vermillion. No other snake in Virginia (except a large water snake found in the Coastal Plain) is colored in this way. The usual habitat, as indicated by the few local records (mostly in the Sulphur Springs-Second Dam area), seems to be a very damp thickly wooded region. A specimen found last year seemed to have been dug up and killed by a bait hunter. Attention must be called to the fact that as in many other species, black-phase specimens occasionally turn up in this form. A juvenile found last year was of this nature, being very dark gray, both above and beneath, but the three neck spots remained distinct. The Red-bellied Snake feeds chiefly on small snails and earthworms.

Anyone who has had contact or some experience with any of the snakes listed tonight, or of any kind at all, and would care to pass it on to the writer, is assured that such information will be greatly appreciated.

A STATEMENT TO ALL WHO HAVE AN INTEREST IN THE CONSERVATION OF AMERICA'S NATURAL RESOURCES

Richard L. Hoffman
December 15, 1944, *The Daily Review*

(Author's note. With this installment begins the conclusion of the series that has appeared in *The Daily Review* since late June. It is hoped that this column, and the one or two to follow, will be read and understood by all who have followed the series. They will profit, it is hoped, by a better understanding of the relation of things in nature, and the interdependence of one form on others.)

Once upon a time, as the story goes, the Michigan Game Commission tried a brilliant stunt. They secured a number of deer and released them upon an isolated island in Lake Michigan which was free from large predatory animals. These deer were left alone for a number of years, and great was the surprise of the Commission members, when, upon visiting the island, they found all the deer dead. With no natural enemies they had so increased that they soon exhausted the supply of forage on the island and had starved.

To bring this little story closer home, we may consider the pigeons and starlings which abound here. Without natural enemies these birds have assumed such numbers that they have become troublesome. Quite often one may see a member of the police force out with a rifle, bravely but futilely trying to check the increase. I say futilely because to all appearance these birds have increased right along. The factors which most affect bird multiplication, generally, are the enemies which destroy the eggs or young birds. In town the nesting places are inaccessible to the few enemies the birds may have.

Almost everyone has read the poem in which the people of a certain town killed all the birds they could find, and were in turn plagued with insects the next year. To elaborate on this theme, it is estimated that if the birds alone were destroyed, the human race would be overcome and wiped out by insects within ten years, despite poisons, traps, and so on.

Those instances are cited as examples of what happens when man deliberately or unwittingly upsets what biologists call "The Balance of Nature." Animals under natural conditions reach a very delicate balance between predator and prey, and this balance must be maintained if any region is to long continue to be fit for human habitation. The results of interference with this balance may not be apparent at once, but are certain to appear in time. Man has not yet reached the stage of intelligence when he can arrange for the "liquidation" of any one species of animal or plant. Any who advocate local or general extinction of a so-called harmful or undesirable species without a lifetime of study of the matter should be awarded a place of honor at some asylum. Many people, for instance, would like to have flies and mosquitoes exterminated. To all appearances that's a pretty good idea, but a very dangerous one to attempt without long study, even if it were possible. How many species of animals depend upon those pests for food? And what forms likewise are dependent upon the first? If flies were wiped out, perhaps some other species which preyed upon flies would also die out. Where would this stop? Would it possibly bring on a plague of something worse than flies? All this must be considered.

When one species of animal or plant is exterminated or depleted greatly many forms suffer, of course, but a greater number flourish up unchecked. If deer were not hunted here each year they would soon increase so much as to be destructive to farmers and overpopulation of the forest would result. When cougars and wolves were killed out in eastern America the task of keeping deer and other animals in check fell to the men who took the country over from those predatory animals.

Most people have well-defined ideas of "vermin." These usually include snakes, hawks, owls, weasels and such forms. Of course everyone knows snakes eat chicken eggs, and that hawks will steal poultry. The fact that these very animals also destroy untold mice and rats is seemingly unknown. Perhaps this is because most people do not think to weigh beneficial against the detrimental. Many farmers will admit that hawks, owls and snakes eat mice, but they rarely SEE this being done, while they are more apt to see a chicken snatched up by a hawk and so are more inclined to put up with mice, small inconspicuous mice, which actually do more damage than 20 hawks. The sight of a snake eating a few hen eggs is much more graphic and tenacious in the memory than the gradual attrition being carried on by unseen animals. Over 1,000 trees, all over 18 years old, were killed

by Pine Mice in a **single** orchard near Charleston, West Virginia. (Farmers Bulletin No. 1395, p. 5)

The principal enemies of field mice are: hawks, owls, snakes, weasels and cats. If the first four were eliminated from the scene the number of mice resulting would soon be appalling. Remember that one pair of mice, if given proper conditions, would multiply into **one million** within two years. These mice would not stay in the woods and fields after stripping all available food there, and cats, dogs, and men would be, I feel, rather ineffectual against such a number. The Pilot Blacksnake, a common local species, consumes about 100 mice per season. As this species of snake is responsible for about one-fourth of the mouse casualty rate, may I suggest that the number of mice killed each year by one hawk, owl, snake and weasel represents **potentially** 25,000,000 mice accounted for. That estimate is for those four individuals only.

This discussion will be continued in the next installment.

CONCLUSION

Richard L. Hoffman
December 29, 1944, *The Daily Review*

"And God said, Let us make man in our image, after our likeness: and let them have domination over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth." (Genesis 1:26.)

It is apparent that man has certainly misused his power of dominance over the earth, the more "civilized" races doing the worst, of course. Not only in making remarkable efforts to exterminate his own race, but also in the most ruthless exploitation of any and all kinds of natural wealth has man put his domination to shameful use. Only three hundred years ago this country was certainly the richest in the world, and is so still today only because of the tremendous amount of natural resources here originally. The development of America was accompanied by exploitation and heedless depletion on a giant scale. This gross wastefulness, so characteristic of the American people in general, has just within the past few decades been checked to some extent. Deforestation, soil erosion, floods, wildlife extermination, stream pollution; these are a few of the more outstanding transgressions of man against a nation once wonderfully rich in natural wealth and capable of tremendous potential development.

With regard to deforestation, it is known that FIVE-SIXTHS of all our original forest acreage has gone under the lumberman's axe and the camper's match. Quite frequently lumbering and forest fires cooperate in deforestation. Since about 97 per cent of the fires are caused by some human agency, directly or indirectly, one can see the progressive effect of civilization upon forests in general. Removal of forest cover is followed immediately by erosion and subsequent floods. When vegetation is removed from a hillside, water has no inclination to soak into the ground, but runs off quickly, carrying soil with it, and giving rise to a system of gullies which soon carry away a great amount of topsoil. Replanting of the areas near the headwaters of the Ohio River would have a much more pronounced effect on floods than hundreds of miles of levees and dams farther downstream.

There are two kinds of soil erosion, these caused by water and wind. The former has been mentioned in the previous paragraph. The latter is common to flat areas of the middle west, where there are no hills or trees to break the force of the wind. When the grass cover that holds the soil particles together is removed, the soil soon dries out in the sun and is easy to blow away. While this occurs almost everywhere in the west, the most well-known example is the Oklahoma Dust Bowl. Until quite recently this region was a very fertile country, capable of yielding large grain crops if properly farmed. Just after the World War farmers indiscriminately plowed this area up to plant wheat. That winter, after the wheat had been harvested, the soil began to blow away. Once started, there was no stopping this rapidly growing desert, which soon claimed thousands of square miles and made equal thousands of farmers homeless. In recent years the Soil Conservation Commission has been able to check the spread of this sterile desert, and to begin reclaiming it. An unbelievable amount of topsoil has been blown away from this area. While water erosion is most prevalent in the southeastern states, where gullies rapidly consume entire farms, it is by no means restricted there. Every year the Mississippi River carries thousands of TONS of topsoil into the Gulf of Mexico and the delta of that river has increased perceptibly since large scale farming started in the central states. The Tennessee Valley Administration is a shining example of how large areas can be reclaimed, but great amounts of money must be spent in order to do this. Increased taxation may be necessary, and Americans for generations to come will be paying for the greed and ignorance of their ancestors.

As far as wildlife depletion goes, everyone is aware of the sad end of the passenger pigeon and heath hen. The buffalo, elk, mountain sheep and egret almost joined their ranks. Only timely governmental protection saved these species. Indiscriminate hunting has not been the only factor in the general depletion of most game animals. Forest fires, drainage of lakes and marshes, extensive cultivation, and stream pollution have also generously assisted. Most game animals are on the increase now, thanks to wildlife refuges and controlled hunting and fishing. Most hunt clubs have also helped in this way. It is a regrettable condition that game wardens are necessary to see that the laws are obeyed, but evidently there are still many persons who have no scruples whatever against trying to satisfy a peculiar lust of their own, even though it undoes the work of years and greatly inconveniences other sportsmen.

In regard to stream pollution, a very notable example may be found in our own community. In fact it need not be looked for, as it often makes its presence known in an unpleasant way. It is certainly not pleasant to have this turbid stream flowing through our fair city, to say the least. I feel certain that every citizen of Clifton Forge has condemned it at one time or another, but it seems that no concerted effort has been made to correct it. No industrial concern should be allowed to so ruin a river and so inconvenience downstream dwellers. It seems reasonable to believe that a unified effort on the part of various local organizations would result in improvement or complete correction of the situation. If such results were obtained, however, a responsibility would fall to Clifton Forge. If Covington were made to provide us with a pure stream we should certainly install a sewage plant, instead of employing the present system, which is to terminate the main pipe at the river. This is hardly a proper method of disposal, and is no better than contamination of the stream by chemicals.

After 250 years of constant and heedless exploitation of natural resources this country is just beginning to get conservation policies into operation. The Forest Service, Soil Conservation Commission, CCC, Biological Survey, Bureau of Mines, Tennessee Valley Administration, and many other organizations have not had long to do the excellent work thus far finished. Their methods and policies may not be completely successful and convenient to all right at first, and many persons have criticized these government agencies. Let those who think in such a way bear in mind that whatever faults these organizations may have, they are at least making extremely good efforts to save what is left of our natural wealth, and to replenish what they can for future use. In so doing, in checking and repairing damage which has costs our nation untold millions of dollars, the government is certainly justified in placing any regulation, regardless of how strict, upon use of our remaining natural resources. The present restrictions are made with a great deal of thought for the convenience of American citizens, many of whom have shown that they are unworthy of any consideration. In pre-war Germany lumbering concerns were compelled to plant two trees for each one cut. That is certainly not required here, although it would be a very worthwhile thing. As long as the government is doing its best to provide for the convenience of its people at the same time it conserves the country's wealth, everyone should co-operate with it in every way possible until our natural resources are again on a fairly stable basis.

Miscellanea

The Virginia Natural History Society: A Brief History of the First 20 Years

Prepared by Steve Roble, Editor, *Banisteria*

The Virginia Natural History Society (VNHS) and its journal *Banisteria* arose from the need to provide a forum for people interested in natural history to interact and share their observations, and to have the opportunity to publish observations and data in a low-cost, author-friendly medium. Academic trends in recent decades toward cellular and molecular biology at the expense of organismal biology, with the resultant unfavorable perception of natural history, as well as the high costs (and rejection rates) of many journals were primary considerations in launching the journal and forming the society. Further details about the origins and early history of the journal and society can be found in Mitchell (1993).

Banisteria is named in honor of John Banister (1640-1692), an Englishman who was the first university-trained naturalist to work in Virginia. The first issue of the journal was published in November 1992, three hundred years after Banister's accidental death. A brief review of his life and accomplishments was prepared for the inaugural issue of *Banisteria* by Joseph and Nesta Ewan (1992), Banister's biographers (Ewan & Ewan, 1970). The original coeditors of the journal were Joseph C. Mitchell and Richard L. Hoffman. Mitchell initially conceived of the idea for a journal and Hoffman suggested its name. The society was formed the following year largely through the efforts of Michael Kosztarab, who served as the first president (Fig. 1).

The Virginia Natural History Society is a tax-exempt, nonprofit organization under Section 501(C)3 of the Internal Revenue Service. The society's articles of incorporation and bylaws were published in the second issue of *Banisteria*. Membership is open to anyone with an interest in natural history, especially of Virginia and surrounding states. The society defines natural history in a broad sense, from the study of plants, animals, and other organisms to the geology and ecology of the state, to the natural history of the native people who inhabit it. Its goals are to promote research on the natural history of Virginia, educate the citizens of the Commonwealth on natural history topics, and to encourage the conservation of natural resources.

Fig. 1. Attendees of the first meeting of the VNHS Executive Committee, Hampden-Sydney College, December 1993. From left to right: Barry Knisley, Tom Rawinski, Joe Mitchell, Richard Hoffman, Anne Lund, Dick Neves, and Michael Kosztarab (president).

A summary of the society's officers since its inception is provided in Table 1. We have had 10 presidents to date, with Barry Knisley serving two separate terms and Dick Neves presiding for about 3.5 years after his predecessor moved out of state. Cumulatively, 28 individuals have served the society as officers, editors, and webmasters. Several others have served for many years as associate editors of *Banisteria* (e.g., Tom Wieboldt for botany since 1993 and Al Wheeler for entomology since 1995). Four non-members, including Richard Hoffman's son Carl and my wife Pat, assisted in formatting *Banisteria* during the first dozen years. Rick Boland, former editor of publications at the Virginia Museum of Natural History, played a crucial role in helping to develop the layout for the first five issues of *Banisteria*. Every year or two the society seeks new candidates for the positions of councilor and vice president (automatically becomes the next president), so members who are interested in serving the society in either of those roles or in some other capacity should contact the current president.

Membership levels in the VNHS have fluctuated considerably during its brief history, reaching a peak of about 165 (including 22 institutions) in 2002-2004 and declining since then to its present level of about 110, where it has remained steady for the past several years. The society is always seeking new members, striving to retain current members, and attempting to recruit former members to rejoin the society. Student members are always welcome to join at the reduced annual fee of $5, which includes two issues of *Banisteria*.

The VNHS was instrumental in helping to create the Biodiversity and Natural History section of the Virginia Academy of Science (VAS) in 1993. For a dozen years (1994-2005), the VNHS met informally in conjunction with the Biodiversity and Natural History section at the annual VAS meeting. This practice was discontinued due to limited participation by VNHS members and lack of recognition by VAS. Through the efforts of Ralph Eckerlin, current society president, an attempt will be made to revive participation by VNHS members at the spring 2013 VAS meeting at Virginia Tech (see

Table 1. History of VNHS Officers (1992-2012)

President (and Vice-President)	
Michael Kosztarab	1992-1994
Barry Knisley	1995-1996 (VP 1992-94)
Thomas Rawinski	1997 (part; VP 1995-96)
Richard Neves	1997-2000 (VP 1997, part)
Werner Wieland	2001-2002 (VP 1999-2000)
Barbara Abraham	2003-2004 (VP 2001-2002)
Judith Winston	2005-2006 (VP 2003-2004)
Thomas McAvoy	2007-2008 (VP 2005-2006)
Barry Knisley	2009-2010 (VP 2007-2008)
Ralph Eckerlin	2011-2012 (VP 2009-2010)
Todd Fredericksen	(VP 2011-2012)
Secretary-Treasurer	
Anne Lund	1992-2007
Bill Shear	2008-
Councilors	
Richard Neves	1993-1996
Thomas Rawinski	1993-1994
Carolyn Wells	1993-1994
Norman Fashing	1995-1998
Judith Winston	1996-1998
Steven Roble	1997-2000
Michael Kosztarab	1999-2000
Joella Killian	1999-2002
Thomas McAvoy	2001-2004
Paul Bedell	2001-2005
Michael Donahue	2003-2006
Arthur Evans	2005-2008
Janet Reid	2006-2009
Michael Lachance	2007-2010
Oliver Flint	2009-2012
Lisa Williams	2010-
Richard Grover	2011-
***Banisteria* Editors**	
Richard Hoffman	1992-1999
Joseph Mitchell	1992-2007
Steven Roble	2000-
Honorary Councilors	
Richard Hoffman	2001-2012
Michael Kosztarab	2001-
Joseph Mitchell	2009-
Webmaster	
Kenneth Stein	1999-2001
John White	2002-

announcement above).

Banisteria was published once per year during the first two years (1992-1993, totaling 53 pages), but two issues of the journal have been published annually since then. Articles have covered a wide variety of subjects, including archaeology, anthropology, botany, ecology, zoology, limnology, geology, geography, and climatology. Most papers have concerned animals, though more papers in the other disciplines are always welcomed. Approximately half of all papers have concerned insects and other invertebrates. More papers on vertebrates and plants are especially desired in the future. A summary of *Banisteria* publications during the first decade of its existence was prepared by Mitchell & Roble (2002). A brief update follows.

Between 1992 and 2012, 353 papers, 46 book reviews, five biographies, and nine obituaries were published in *Banisteria*. The 40 issues of the journal published to date have contained a total of 2,508 pages, thus averaging nearly 63 pages per issue. In all but one of the past 17 years, more than 100 pages were published in *Banisteria* (Fig. 2). In eight years, at least 125 pages were printed annually and three times more than 150 pages were published during the year, including both 2011 and 2012. Three single issues of *Banisteria* have exceeded 100 pages each, including the current one, which is the second largest issue published to date. Several hundred authors have published papers in *Banisteria* during the past two decades, typically averaging 20-25 authors per year (Fig 3). The peak year was 1999 with 53 authors, most of whom contributed papers to the Big Levels symposium proceedings (*Banisteria* #13).

Beginning in 2008, four issues of *Banisteria* have included color photos or illustrations, including two

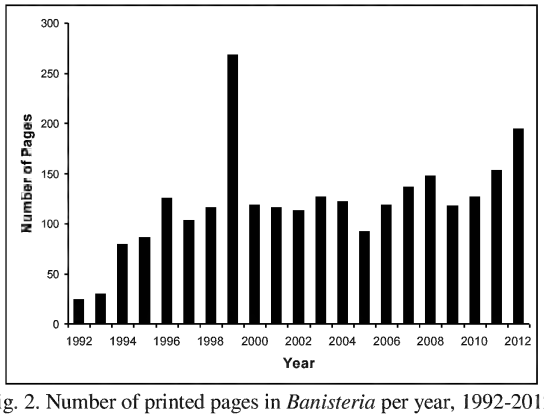

Fig. 2. Number of printed pages in *Banisteria* per year, 1992-2012.

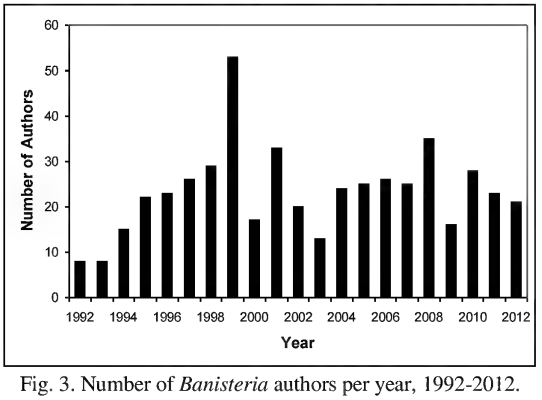

Fig. 3. Number of *Banisteria* authors per year, 1992-2012.

with color covers. Seven of John Banister's original sketches of plants from the late 17th century have appeared on the front or back covers of the journal over the years, with his drawing of Sweetbay Magnolia (*Magnolia virginiana*) being used exclusively on the cover of the first ten issues of *Banisteria* (also #25 and #39). Several other Banister drawings, including a horseshoe crab, have been published in the journal. Original illustrations by 10 other artists, including five each prepared by Richard Hoffman and Will Brown, have graced the front or back covers of *Banisteria*. The society's logo, which features Banister's drawings of a fern and fossil shark's tooth, was designed in 2009. It has appeared on the front and back covers of *Banisteria* (#34 and #37, respectively). A previously unpublished book manuscript of natural history essays, mostly pertaining to the Dismal Swamp, written by Roger Rageot appeared posthumously in two consecutive issues of *Banisteria* (Rageot, 2007a, b). In 2010, a new section entitled "Historical Contributions" was initiated to accommodate papers of relevance to the history of natural history in Virginia. A "Natural History Biographies" section is also available for publishing biographies of past naturalists with ties to Virginia. Submissions relevant to either of these sections are always desired.

The Virginia Natural History Society's website was launched in 1999 by Kenneth Stein. When he left the state two years later, John White volunteered to taken on that role concurrent with his position as webmaster for the Virginia Herpetological Society. John has extensively upgraded and expanded the webpages of the VNHS, including posting the titles of all *Banisteria* papers and pdf reprints of many of them. The eventual goal is to have pdf copies of all past issues available as free downloads from the website. After many years of being hosted by the Conservation Management Institute at Virginia Tech, the society's website was moved to a commercial web-hosting company in 2012. Most visitors to the VNHS website live in the eastern United States, but residents of some western states, Canada, Mexico, and at least four other continents (Africa, Asia, Europe, and South America) have also visited the website. Visitation continues to grow each year, reaching nearly 6,200 visits and more than 60,000 "hits" during 2012.

The Virginia Natural History Society has cosponsored three symposia to date. Presentations made at the October 1998 symposium in Charlottesville on the ecology and natural history of the Big Levels area (including the Maple Flats sinkhole ponds and Saint Mary's River) of Augusta County were published in *Banisteria* #13, the largest issue of the journal to date at 210 pages. In September 2007, the society cosponsored a symposium at the newly built Virginia Museum of Natural History in Martinsville in celebration of Richard Hoffman's 80th birthday and career achievements. Manuscripts derived from that symposium, plus additional submissions from other (mostly foreign) authors who were unable to attend, resulted in a *Festschrift* volume that was edited by the *Banisteria* co-editors at that time and published by the museum (Roble & Mitchell, 2009). Two years later, the society hosted another symposium at the museum entitled "Historical Explorations into Virginia's Natural History." Several papers from that symposium will be published in the next issue of *Banisteria*.

The Virginia Natural History Society provided financial support to four Bioblitz surveys between 2002 and 2006. Many members of the society participated in one or more of these surveys. The results of the last survey, held at the Potomac Gorge area of northern Virginia and adjacent Maryland, were published in *Banisteria* #32 (Evans, 2008). On several occasions in the past, VNHS provided financial support to the Virginia Museum of Natural History's student research grants program. In the fall of 2012, VNHS contributed to a special fund established by a bequest from Richard Hoffman for future curation of the Recent Invertebrates collection at the museum.

The future of the Virginia Natural History Society depends on both current and new members who are willing to serve as officers, editors, and webmasters, to recruit new members and help raise the profile of the society, or to volunteer to organize symposia, meetings, field trips, and other activities. The society will especially require a younger generation of new leaders and members to carry it forward in the coming decades.

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Reports

1. President's Report

When the Nobel Prizes in Chemistry, Physiology & Medicine, and Physics are announced each year the spotlight falls on scientists. This is perhaps the only time that scientists are accorded the credit and adulation that athletes and rock stars enjoy. Were any of the Nobel Prize winning papers published in our journal, *Banisteria*? No, not one. Those are not the kinds of research papers you will see in *Banisteria*. It is a vehicle for the publication of Natural History phenomena. Upon the death of Richard Hoffman, *Banisteria* lost one of its most prolific contributors. *Banisteria* publishes new distribution records, surveys, observations, and ecological studies and welcomes your contribution. Pull out those old data sheets and get them written up for submission. There are no page charges for members.

VNHS members have been invited to give research presentations, either oral or poster, at the Virginia Academy of Science (VAS) meeting at Virginia Tech University on 23 May 2013. VNHS members DO NOT need to be VAS members to present. A number of the VAS sections may be appropriate for your presentation topic. Among these are Botany, Environmental Science, Biology, and Natural History & Biodiversity. The latter is the section formed by our Society. The call for titles will go out electronically, as will registration information as it becomes available. There are awards for best student papers in most sections.

This is my last report as President of the Virginia Natural History Society. The Society has survived my tenure! The VNHS is still financially sound and our journal continues to be an interesting and viable journal. One of my goals was to increase membership in the Society. That has not happened. However, I will continue to work on increasing the numbers of members and subscribers. You can help; get just one of your colleagues to join. I thank the Society officers, councilors, webmaster, and our hard-working editor for the support given me these past 2 years. The new officers will continue to improve our Society.

Respectfully submitted
Ralph Eckerlin, President, VNHS

2. Minutes of the Executive Committee of the Virginia Natural History Society Meeting of December 8, 2012

The 2012 meeting of the Executive Committee of the Virginia Natural History Society was called to order by President Ralph Eckerlin at 1:00 PM on December 8, 2012, in Settle Hall at Hampden-Sydney College, Hampden-Sydney, Virginia. In attendance were Ralph Eckerlin, Bill Shear, Steve Roble, Todd Fredericksen, Oliver Flint, Lisa Williams, and Richard Groover.

The meeting began with a moment of silence in memory of Richard Hoffman.

The minutes of the 2011 meeting and the report of the secretary-treasurer were approved unanimously. The report is appended to these minutes. In response to questions, Bill Shear pointed out that the society had made a contribution of $1,000 to the Hoffman Fund at the Virginia Museum of Natural History.

Steve Roble presented the editor's report. *Banisteria* No. 39, for Spring 2012, was mailed 25 September 2012. Number 40 is planned as a Richard Hoffman memorial issue, with all contents written or coauthored by Hoffman, including 27 contributions to the Clifton Forge newspaper, first published in 1944. This issue may be ready by late February, 2013. Number 41 will contain papers submitted as part of the symposium on the history of natural history in Virginia; this issue may be out as soon as May, 2013. Number 42 will be a single-topic issue on the invertebrate cave fauna of Virginia. Steve also noted that the first five issues of *Banisteria* have been scanned by Tom McAvoy and are on line.

Ralph Eckerlin presented the president's report. He noted that the society remains financially secure, *Banisteria* continues to be published, and the membership has stabilized at 100-110. There followed discussion of means whereby the membership might be increased. Readers of these minutes are referred to the minutes of the meetings of 2010 and 2011 for details of these ideas.

Ralph also pointed out that nothing has as yet been done to either bring the bylaws of the society into line with actual practice, or to change our procedures to conform to the bylaws as written. He promised to work on a revision of the bylaws as immediate past president.

Richard Groover discussed the possibility of organizing some kind of excursion in connection with

the meeting of the Virginia Academy of Science in May and volunteered to investigate the options.

Ralph noted that we need to elect a vice-president and one new councilor; Nancy Moncrief has agreed to be nominated as a councilor but no candidates have been proposed for Vice President.

The meeting adjourned at 2:36 PM.

Respectfully submitted,
William A. Shear, Secretary/Treasurer

3. Secretary-Treasurer's Report, December 2012

As of December 5, 2012, the society has 109 members, including 17 institutions. This represents a decrease in membership from December 2011 (117 members, 19 institutions). In December 2010, we had 105 members, including 17 institutions. Except for 2011, membership has declined over the past six years from the most recent high point in 2004, when we enrolled 165 members, including 22 institutions.

Our current bank balance is $8,353.00, down $1,737.37 from six months ago.

Respectfully submitted,
William A. Shear, Secretary/Treasurer

4. Webmaster's Report

VNHS website traffic during 2012 is summarized in the following table:

Month	Sites	Visits	Pages	Files	Hits
January	338	240	373	2016	3573
February	375	312	434	2183	3536
March	380	329	418	2134	2934
April	548	423	640	3329	5172
May	499	429	623	2504	3653
June	713	496	797	3889	5755
July	855	667	1113	3246	5909
August	634	781	1633	3898	6574
September	603	765	1569	3769	6270
October	574	645	1305	3699	5992
November	813	601	1262	3907	6303
December	568	501	881	2980	5022
Total	-----	6189	11048	37554	60693

The Virginia Natural History Society's website is accessible at http://virginianaturalhistorysociety.com. The shorter website address (http://va-nhs.org) is no longer functional.

Respectfully submitted,
John White, VNHS Webmaster

5. Editor's Report

This belated memorial issue of *Banisteria* contains an obituary for founding co-editor and recent associate editor Richard Hoffman, as well as some of his first (reprinted) and last papers pertaining to the natural history of Virginia. He and Joe Mitchell published the first issue of *Banisteria* on November 13, 1992. In observance of that occasion, I prepared the brief summary of the society's first 20 years that appears above.

The next issue will include several papers from the society's 2009 symposium entitled "Historical Explorations into Virginia's Natural History." I anticipate that the fall issue will be a special issue concerning the cave invertebrate fauna of Virginia, meaning that a backlog of accepted manuscripts may accumulate for publication in the spring of 2014 and hopefully ensure more timely publication of this journal.

Respectfully submitted,
Steve Roble, Editor, *Banisteria*

Announcements

1. Membership Renewal and Ballot

A membership renewal notice for *Banisteria* numbers 41 and 42 (2013) and election ballot are enclosed with this issue. Positions up for election this year are vice president, secretary/treasurer, and one councilor. Please return your dues and the ballot to Dr. William A. Shear, Secretary/Treasurer, Virginia Natural History Society, Box 96, Hampden-Sydney College, Hampden-Sydney, VA 23943.

2. Future meetings

Joint meeting of Virginia Natural History Society
and Virginia Academy of Science, Blacksburg, VA

Members of the Virginia Natural History Society (VNHS) have been invited to participate in a joint meeting with the Virginia Academy of Science (VAS) at its 91st Annual Meeting at Virginia Tech in Blacksburg. The joint meeting will be held on May 23, 2013. VNHS members DO NOT need to be VAS members to present a paper or poster, but all presenters must register to attend the meeting. This is a one time trial and a change of policy for the VAS.

A number of the VAS sections may be appropriate for your presentation topic, such as Botany, Environmental Science, Biology, and Natural History &

Biodiversity. The latter is the section formed by our Society. Titles are due by February 11, 2013 to the secretary of the appropriate section (see the VAS website for contact information). Registration information will be posted on the VAS website at http://66.147.244.216/~vacadsci/. There are awards for best student papers in most sections.

Wilson Ornithological Society, College of William & Mary, Williamsburg, VA

The Wilson Ornithological Society's (WOS) 125th anniversary meeting will be held at the College of William & Mary during March 7-10, 2013. WOS meetings are known for their unique blend of academic ornithologists and citizen scientists, as well as their extremely welcoming atmosphere for students. Special symposia on the "History of American Ornithology" and "Birds and Human Disease" will be held. More information is available at http://www.cvent.com/d/hcqx10. Questions should be sent to local host Dan Cristol (dacris@wm.edu).

Terrestrial Invertebrates Conference, North Carolina State Museum of Natural Sciences, Raleigh, NC

The North Carolina State Museum of Natural Sciences will host a symposium entitled "Non-Insect Terrestrial Invertebrates of the Southeastern United States" on March 9, 2013 in the museum's new Nature Research Center. The goals of this free, full-day symposium are to highlight current research on the substantial, yet relatively neglected, non-insect invertebrate fauna of this region while simultaneously celebrating the lifetime scientific achievements of Dr. Rowland Shelley, the Museum's Curator of Terrestrial Invertebrates. Taxonomic groups to be addressed in the symposium will include flatworms, nematodes, earthworms, leeches, terrestrial snails and slugs, isopods (sowbugs), millipeds, centipeds, spiders, mites, harvestmen, and scorpions. For more information about the museum visit http://naturalsciences.org/visitor-info.

Avoiding Extinction: Contemporary Approaches to Conservation Science, Smithsonian Botanical Symposium, Washington, D.C.

The 11th Smithsonian Botanical Symposium (April 19-20, 2013), hosted by the National Museum of Natural History's Department of Botany and the United States Botanic Garden, will highlight past efforts and new threats to conservation goals, as well as new approaches underway that promise to safeguard regional and global biodiversity. Invited speakers will cover a wide range of endangered organisms, with a special focus on plants, to illustrate the challenges of modern-day conservation science in a rapidly changing world. Registration and poster abstract submission begins February 1, 2013. More information is available at http://botany.si.edu/sbs/

Dragonfly Society of the Americas, Richmond, VA

The Southeast regional meeting of the Dragonfly Society of the Americas will be held April 26-28, 2013 in Richmond, Virginia. Daily field trips will be made to various sites along the James River as well as several local parks and nature preserves. More information is available at http://mamomi.net/SEDSA2013/SEDSA/Welcome.html. Questions may be directed to local hosts Paul Bedell, Anne Wright, Richard Groover or Steve Roble (see website for email addresses).

3. News of Members

Ralph Eckerlin, outgoing VNHS President, retired in the spring of 2012 after serving on the faculty at Northern Virginia Community College for 41 years. For 25 of those years he also taught a parasitology course at George Washington University. We wish him well in his retirement and thank him for his service to VNHS.

Judy Winston, former VNHS President (2005-2006) and current curator of marine biology at the Virginia Museum of Natural History, has published a book entitled "The Marine Bryozoans of the Northeast Coast of the United States: Maine to Virginia" (coauthor Peter Hayward). See the museum store's website (http://www.vmnh.net/store.cfm?itemID=142) for more details. The cost is $39 (including shipping).

4. *Flora of Virginia* published

The new *Flora of Virginia* manual, which treats 3,200 taxa that are native to or naturalized in the state, was published in late November 2012, exactly 250 years after our only other flora, 1762's *Flora Virginica.* Copies can be purchased from the Botanical Research Institute of Texas Press at http://www.brit.org/brit-press/books/virginia, or by sending your payment ($79.99 + $6.50 shipping) to BRIT Press, 1700 University Drive, Fort Worth, Texas 76107-3400. Within its 1,500 pages, *Flora of Virginia* features species descriptions, identification keys, and more than 1,000 pen-and-ink illustrations, plus chapters on the history of botanical exploration in the state and the nature of the Virginia flora. We hope to publish a review of this important work in a future issue of *Banisteria.*

Virginia Natural History Society

http://virginianaturalhistorysociety.com/

General Information

The Virginia Natural History Society (VNHS) was formed in 1992 to bring together persons interested in the natural history of the Commonwealth of Virginia. The VNHS defines natural history in a broad sense, from the study of plants, animals, and other organisms to the geology and ecology of the state, to the natural history of the native people who inhabit it. The goals of the VNHS are to promote research on the natural history of Virginia, educate the citizens of the Commonwealth on natural history topics, and to encourage the conservation of natural resources.

Dissemination of natural history information occurs through publication of the journal *Banisteria*, named for John Banister (1650-1692) who was the first university-trained naturalist to work in Virginia. The first issue was published in 1992, and the journal is published twice per year in spring and fall. Articles cover a wide array of subjects, and prospective authors are encouraged to submit manuscripts on any aspect of natural history in Virginia; papers may pertain to Virginia or regional archaeology, anthropology, botany, ecology, zoology, paleontology, geology, geography, or climatology. Book reviews, biographies, and historical accounts of relevance to natural history in Virginia also are welcomed. Manuscripts are peer-reviewed for suitability and edited for inclusion in the journal.

Page charges ($20/page) are waived if the sole or first author is a VNHS member. All authors must pay $75/page if they desire color printing of figures. The society's website contains detailed instructions for authors, the titles (and abstracts beginning in 2004) of all *Banisteria* papers, and downloadable versions (PDF format) of numerous articles from past years.

Memberships

The VNHS is open to anyone with an interest in natural history and welcomes participation by all members in society activities and efforts to promote education and conservation. Membership includes a subscription to *Banisteria* and invitations to periodic symposia and field events. Annual dues for members are $20 (per calendar year); library subscriptions are $40 per year. Checks should be sent to the Secretary/Treasurer, who also has back issues of *Banisteria* available at $10.00 each (except Nos. 1-6 are $5.00 and No. 13 is $18.00). The VNHS is a tax-exempt, nonprofit, society under Section 501(C)3 of the IRS. We welcome donations to support our mission in Virginia.

Virginia Natural History Society

Application for Membership

Name _____

Address_____

_____

_____

Zip Code _____

Phone _____

Email _____

Area(s) of Interest _____

ANNUAL DUES AND SUBSCRIPTIONS TO *BANISTERIA*

(memberships and subscriptions are by calendar year; subscribers/members outside the United States should add $3.00 for additional postage)

- ☐ $500.00 Life (not annual)
- ☐ $300.00 Benefactor
- ☐ $100.00 Patron
- ☐ $50.00 Supporting
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- ☐ $25.00 Family
- ☐ $20.00 Regular
- ☐ $5.00 Student (see below)

☐ I have added a contribution of $_____ to my membership dues.

The special student rate is applicable only when accompanied by the following certification signed by a faculty advisor.

Institution _____

Advisor _____

Date_____

Make checks or money orders payable to:
Virginia Natural History Society

Send membership form and dues to:
Dr. William Shear, Secretary-Treasurer
Virginia Natural History Society
Box 96
Hampden-Sydney, VA 23943